TABLE 23.1

ABNORMAL CONDITIONS

Component	Short-Circuit	Open-Circuit
Capacitors	X	X
Inductors	X	X
Relays	X	X
Resistors:		
Carbon	X	X
Other		X
Semiconductor devices	X	X
Switches	X	X

triacs SCR's microprocessor chips, etc.

Revised Table 23.1 effective (__ months after date of publication)

(NEW)

23.6C When a semiconductor device is subjected to external triggering, the fence controller shall comply with paragraphs 23.6 and 23.6B.

Added paragraph 23.6C effective (__ months after date of publication)

23.7 In conducting the test, a single layer of cheesecloth is to be loosely draped over the fence controller as a whole with the controller placed on a white-tissue covered softwood surface. The controller is to be connected to a supply circuit of rated voltage and frequency and operated until (1) ~~a fire has developed~~ the cheesecloth or tissue paper glows or ignites, (2) the circuit or a component in the circuit (including an overcurrent-protective device) has opened, or (3) no further change takes place, but in no case is the test to be continued for more than 7 hours. ~~A risk of fire is considered to exist if the cheesecloth or tissue paper glows or ignites.~~

Revised paragraph 23.7 effective (__ months after date of publication)

FOK

To: Division of Corrective Actions, Attn: Marc J. Schoen
From: CENTRAL Regional Center
Subject: Section 15 Field Investigation Status

File Number : FC890040 Date Opened: 89/03/06 Date Closed: __/__/__
CACA Contact: ~~C. DAVIS~~ RO: ~~EF~~ FOCR TRogers/L.G.GAYMAN
Company Name: FI-SHOCK, Inc.
Street : 5360 NATIONAL DRIVE
City : KNOXVILLE State: TN Zip: 37914
Co. Contact : _____ Phone___-___-____
Type :Mfg X Dist___ Retail___ Prv Labeler___ Importer___
NEISS PRODUCT CODE: 0605
Product Description: SOLID STATE PET DETERRENT ELECTRIC FENCE [redacted] CONTROLLER

Model : #SS-750
Brand : FIDO - SHOCK
Potential Hazard: Electrocution
IDI: 88111SCCC20601 / _____
Sample: _____ / _____
Comments: _____
Location: _____ Accession: _____ Box: *

* * * * * * * * * *

REGIONAL CENTER PLANS FOR FOLLOW-UP

PRIORITY: A B C D (Circle)
Pot. Timeliness: ___yes ___no

TIMETABLE

3/16/89 Data Dump Requested __/__/__ Kick-Off Meeting
__/__/__ Establishment Inspection
__/__/__ PSA Submitted __/__/__ PSA Response
__/__/__ PSA Submitted __/__/__ PSA Response
__/__/__ Other Investigation _____ IDI's _____ Samples
__/__/__ Establishment Inspection
__/__/__ Preliminary Determination To Be Submitted

① Ostentic check ② Data Dump

[Form 1b - field input(REVISED 1/88)]

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FOR OFFICIAL USE ONLY

APR 27 1990

Dan McCarter
Chief Engineer
Fi-Shock Inc.
5360 National Drive
Knoxville, TN 37914

RE: CPSC RP890087
Fido-Shock Pet Deterrent
Model No. SS-750

Dear Mr. McCarter:

The staff of the Directorate for Compliance and Administrative Litigation of the U.S. Consumer Product Safety Commission (Commission) has reviewed all of the information that you have provided concerning the Fido-Shock Pet Deterrent, Model No. SS-750. After careful consideration and in accordance with 16 C.F.R. § 1115.12(a), the Compliance staff has made a preliminary determination that Fido-Shock Pet Deterrent, Model No. SS-750 presents a substantial product hazard as defined by section 15(a) of the Consumer Product Safety Act (CPSA), 15 U.S.C. § 2064(a).

Specifically, the triac (semiconductor switch) on the printed circuit board of the SS-750 controller may be defective (short-circuited) as installed or may short circuit during product use. A short-circuited triac will immediately cause one or both 1/16th ampere time delay fuses located on the controller case (accessible to the user) to open the circuit. The user can intentionally or inadvertently replace one or both opened (blown) 1/16th amp fuses with fuses of a higher amperage rating. This would produce a fence terminal output of continuous unpulsed potentially lethal electric current at 800 volts or more for an unknown period of time. This design defect is exacerbated by the fact that the labeling on the controller does not adequately warn the user about the consequences of overfusing or replacing opened (blown) 1/16th amp fuses with fuses of a higher amperage rating. Contact with a metal wire fence energized with continuous, unpulsed electric current at high voltage would create a severe electric shock or an electrocution hazard.

The staff welcomes and will give full consideration to any comments or additional information from the firm concerning its preliminary determination. The staff will meet with the firm as necessary to discuss its comments or corrective action.

Voluntary Corrective Actions

The staff requests that the firm take voluntary action to notify consumers and to recall or correct potentially hazardous products which are in the chain of distribution and in the possession of consumers. If the firm agrees to take voluntary corrective action, please submit a written corrective action plan describing the actions which it plans to take. Section 1115.20(a) of the enclosed regulations on Substantial Product Hazard Reports, 16 C.F.R. § 1115.20(a), outlines the elements of an appropriate corrective action plan. The staff has also enclosed examples of recall actions taken by firms that the firm may find useful. The staff will review the firm's plan promptly and discuss with it any suggestions it has or additional measures it believes Fi-Shock Inc. should take.

In addition to the request that Fi-Shock Inc. recall or correct potentially hazardous products in possession of consumers, the staff requests that Fi-Shock provide the following notification:

1. Direct letter notification to all Fi-Shock customers, instructing them to stop sale and return inventory, and to sub-recall this recalled product from consumers or from identified purchasers.

2. Point of purchase posters to be displayed at all customer locations, for a period of 120 days.

3. Paid advertising in at least three appropriate magazines, including pet magazines.

Additionally, rather than the Commission unilaterally issuing a press release, the staff believes it would be appropriate for the firm and the Commission to issue a joint press release announcing the recall. The staff will work the firm to develop and issue a mutually acceptable release.

A voluntary corrective action plan must include an agreement that the Commission may publicize the terms of the plan and inform the public of the nature and the extent of the alleged substantial product hazard. Please read carefully the enclosed document on "Information Disclosure" dated May 12, 1983. This document discusses the statutes and regulations which govern the Commission's disclosure of information and explains Commission staff's policy on the disclosure of information concerning product recalls and similar actions.

When the corrective action program begins, the Division of Corrective Actions will monitor the progress of the corrective action. The staff requests that the firm provide monthly progress reports to the Division of Corrective Actions (using the enclosed form). Please provide any other information requested so that the staff can monitor the effectiveness of the corrective action at various levels of the distribution chain.

If the firm receives any information concerning other incidents or injuries, or information affecting the scope, prevalence or seriousness of the defect or hazard, it must report that information to this Division immediately. Additionally, if the firm receives information which might indicate that its corrective actions are not satisfactory in eliminating the defect or hazard or that the effectiveness of the corrective action program is less than what has been reported, it must report this information to the Division immediately.

The staff requests a response within 10 working days from receipt of this letter. Please provide a copy of the response to the Regional Center listed below.

The staff will make every effort to work closely and cooperatively with the firm to assure a successful corrective action plan which will protect the public while at the same time create a minimum of burden and inconvenience for the firm. If

you have any questions or desire assistance in responding to this letter, you may contact Tim Jones, U.S. Consumer Product Safety Commission, 5401 Westbard Avenue, Room 230, Washington, D.C. 20207, telephone: (301) 492-6608.

Sincerely,

Marc J. Schoem
Acting Director
Division of Corrective Actions
Directorate for Compliance and
Administrative Litigation

Enclosures
Status Report Form
Information Disclosure Sheet
Examples of Notification Measures

Certified Mail

cc: Consumer Product Safety Commission
Central Regional Center
Suite 2945
230 S. Dearborn St.
Chicago, IL 60604

PRELIMINARY STAFF DETERMINATION
SECTION 15 OF THE CONSUMER PRODUCT SAFETY ACT

LB #: 900099
Date: 3/90
Case Number: RP890087

Date of Report or file opening: 04/17/89

_X_Manufacturer/Importer
___Distributor
___Retailer

Firm and Address:
Fi-Shock Inc.
5360 National Drive
Knoxville, TN 37914

Firm contact: Dan McCarter Phone #: 615-524-7380

Product & Brand Name:
Fido-Shock Pet Deterrent, Model No. SS-750

Price: $90
Product life:

Potential Problem: The triac (semiconductor switch) on the printed circuit board of the SS-750 controller may be defective (short-circuited) as installed or may short circuit during product use. A short-circuited triac will immediately cause one or both 1/16th ampere time delay fuses located on the controller case (accessible to the user) to open the circuit. The user can intentionally or inadvertently replace one or both opened (blown) 1/16th amp fuses with fuses of a higher amperage rating. This would produce a fence terminal output of continuous unpulsed potentially lethal electric current at 800 volts or more for an unknown period of time. This design defect is exacerbated by the fact that the labeling on the controller does not adequately warn the user about the consequences of overfusing or replacing opened (blown) 1/16th amp fuses with fuses of a higher amperage rating.

How problem discovered: A 9/17/88 electrocution incident was investigated as report no. 881115CCC2060. Fi-Shock Inc. received a copy of this report on 4/14/89.

I. Defect:

___Insufficient evidence to support defect determination

__Existing information does not support defect determination

_X_Defect exists: Because of the product's design any SS-750 controller in which the triac fails or short circuits, presents a severe electrical shock hazard since fuses are easily replaced with fuses of higher rating and labeling is inadequate to warn consumers of the risk.

II. Substantial Risk Factors: RP890087

A. Pattern of defect:

_X_Design defect

___Other:

B. Number of defective products: 13,966

Date(s) of production: 7/19/85 to 4/90

Date(s) of distribution: 7/19/85 to 4/90

Geographic Distribution: Nationwide

C. Severity of the Risk:

1. Seriousness of Injury: Contact with a metal wire fence energized with continuous, unpulsed electric current at high voltage could create a severe electric shock or death.

2. Likelihood of injury: It is possible that a consumer will replace a 1/16 amp fuse with one of slightly higher rating after a triac failure and that a small child or adult will contact the fence. One such fatal incident has been reported.

3. Number of incidents & type: One electrocution incident reported involving a four year old male. (881115CCC2060)

III. Assessment of the Substantiality of the Hazard

___Substantial hazard, classification A

_X_Substantial hazard, classification B

___Substantial hazard, classification C

___ Preliminary determination that risk of injury exists,

remedial action by firm be acknowledged and file closed. (Classification D).

___ Preliminary determination not to proceed based on:

RP890087

IV. Compliance with Reporting Obligation:

___Further investigation and review recommended

_X_No further investigation recommended at this time

PD APPROVALS:

Compliance officer Tim Green 4/29/90 Attorney [illegible] 4/25/90

Director, CACA [illegible] 4/25-90

PRELIMINARY STAFF DETERMINATION
SECTION 15 OF THE CONSUMER PRODUCT SAFETY ACT

LB #:
Date: 3/90
Case Number: RP890087

Date of Report or file opening: 04/17/89

_X_Manufacturer/Importer
___Distributor
___Retailer

Firm and Address:
Fi-Shock Inc.
5360 National Drive
Knoxville, TN 37914

Firm contact: Dan McCarter Phone #: 615-524-7380

Product & Brand Name:
Fido-Shock Pet Deterrent, Model No. SS-750

Price: $90
Product life:

Potential Problem: The triac (semiconductor switch) on the printed circuit board of the SS-750 controller may be defective (short-circuited) as installed or may short circuit during product use. A short-circuited triac will immediately cause one or both 1/16th ampere time delay fuses located on the controller case (accessible to the user) to open the circuit. The user can intentionally or inadvertently replace one or both opened (blown) 1/16th amp fuses with fuses of a higher amperage rating. This would produce a fence terminal output of continuous unpulsed potentially lethal electric current at 800 volts or more for an unknown period of time. This design defect is exacerbated by the fact that the labeling on the controller does not adequately warn the user about the consequences of overfusing or replacing opened (blown) 1/16th amp fuses with fuses of a higher amperage rating.

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II. Substantial Risk Factors: RP890087

A. Pattern of defect:

_X_Design defect

___Other:

B. Number of defective products: 13,966

Date(s) of production: 7/19/85 to 4/90

Date(s) of distribution: 7/19/85 to 4/90

Geographic Distribution: Nationwide

C. Severity of the Risk:

1. Seriousness of Injury: Contact with a metal wire fence energized with continuous, unpulsed electric current at high voltage could create a severe electric shock or ~~an electrocution~~ death ~~hazard.~~

2. Likelihood of injury: ~~Unlikely, but possible~~ It is possible that a consumer will replace a 1/16 amp fuse w/ one of slightly higher rating after a triac failure to protect a small child or adult who contacts the fence. One such fatal incident has been reported.

3. Number of incidents & type: One electrocution incident reported involving a four year old male. (881115CCC2060)

III. Assessment of the Substantiality of the Hazard

___Substantial hazard, classification A

_X_Substantial hazard, classification B

___Substantial hazard, classification C

___ Preliminary determination that risk of injury exists, remedial action by firm be acknowledged and file closed. (Classification D).

___ Preliminary determination not to proceed based on:

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I. Defect:

___Insufficient evidence to support defect determination

__Existing information does not support defect determination

_X_Defect exists: Because of the product's design any SS-750 controller in which the triac fails or short circuits, ~~can~~ are presents a severe electrical shock hazard since fuses easily replaced with fuses of higher raiting and labeling is inadequate to warn consumers of the risk.

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_X_Design defect

___Other:

B. Number of defective products: 13,966

Date(s) of production: 7/19/85 to 4/90

Date(s) of distribution: 7/19/85 to 4/90

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3. Number of incidents & type: One electrocution incident reported involving a four year old male. (881115CCC2060)

III. Assessment of the Substantiality of the Hazard

___Substantial hazard, classification A

_X_Substantial hazard, classification B

___Substantial hazard, classification C

___ Preliminary determination that risk of injury exists,

RP890087

IV. Compliance with Reporting Obligation:

___Further investigation and review recommended

_X_No further investigation recommended at this time

PD APPROVALS:

Compliance officer Tim Loo 4/4/90 Attorney_____
Director, CACA_____

FOR OFFICIAL USE ONLY

UNITED STATES GOVERNMENT

MEMORANDUM

U.S. CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, D.C. 20207

FEB 28 1990

TO : Timothy Jones, CACA
Through: Frank E. Brauer, EXPB
Through: William King, Jr., Director, ESEE
FROM : Ted Gordon, ESEE

SUBJECT: PSA 5009; Fi-Shock Inc., Electric Fence Control Circuit Boards; Model SS-750; Sample No. E-100-6808, Subsamples 1-23

REQUEST

PSA 5009 requests an evaluation of 23 circuit boards to determine if their constituent triacs had failed. Also, it requests that other failed components be identified and the consequence to the function of the controller be explained.

BACKGROUND

This PSA is a follow-up to previous safety assessments of the Fi-shock electric fence controller, model SS-750 (see PSA 4553 and 4607). During those investigations it was determined that the triac of the incident controller (a component of its circuit board) had short-circuited so as to offer continuous, boosted ac voltage to the controller's output terminals and therefrom to the fence perimeter wire. It was reported that the unit's fuses opened no matter how many times they were replaced each time the controller was energized. Out of apparent frustration by this, an uninformed consumer overamped the fuses four-fold, which permitted unpulsed voltage to prevail on the fence. Tragically, a child touched the fence and was electrocuted.

In order to determine if a pattern of defect exists, Compliance obtained 23 circuit boards identified by the manufacturer as defective. The components of focus are the triac and the metal-oxide varistor (MOV). The triac is an electronic switch that, under the influence of a timer circuit, "gates" line voltage in brief pulses to the controller's transformer (which boosts the voltage and conveys the pulses to the fence wire). Preceding the circuitry and placed after the fuses, the MOV is the altruistic sentry of the circuit. Allowing normal levels of current to pass, the MOV absorbs intense current surges generated from abrupt, erratic and occasional voltage transients that may harm other, more sensitive, components.

DISCUSSION

Each circuit board was tested and examined at ESEL. The tally of failed components and their effect are tabulated in the attached ESEL report. The results are

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disaggregated and summarized as:

1) Twelve circuit boards had short-circuited triacs. The concomitant effect on the controller is immediate opening of the fuses each time it is plugged in (assuming the specified fuses are employed).

2) Two circuit boards showed short-circuited triacs and opened MOV's. Again, the result is opening of the fuses.

3) The MOV's of three boards were open with damage to no other components. Because some acutely intense voltage transients destroyed the MOV's as they defended more delicate components, the fuses, by their relative position, would also be expected to blow at the same instant. Upon replacing them, however, the controller would be expected to resume functioning. No direct adverse effects result from this particular MOV damage except that thereafter the controller's less sturdy components will be more vulnerable to voltage transients.

4) One circuit board exhibited an MOV that had shorted. In the same fashion as a shorted triac, a shorted MOV will result in immediate opening of the fuses.

5) Four circuit boards were found operational with no apparent defects.

6) One circuit board showed evidence that a consumer had attempted to repair or experiment with it. Both the MOV and the triac of this board were found operational.

CONCLUSION

ESEL determined that the predominant failure found among the circuit boards was the short-circuited triac (16 total). Fuses of the specified rating are expected to open immediately in response to this component malfunction. In those samples in which MOV's were the only failed component (with attendant fuse opening), fuse replacement would restore the unit's function but with added vulnerability to random voltage fluctuations. On those boards where the triac had shorted and the MOV had blown, an educated guess would venture that, in shielding the triac against a sudden voltage surge (as from lightning, but not necessarily), the demise of the MOV was insufficient to absorb all the augmented current. Hence, the triac was overwhelmed as well.

~~FOR OFFICIAL USE ONLY~~

UNITED STATES GOVERNMENT

MEMORANDUM

U.S. CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, D.C. 20207

FEB 28 1990

TO : Timothy Jones, CACA
Through: Frank E. Brauer, EXPB
Through: William King, Jr., Director, ESEE
FROM : Ted Gordon, ESEE

SUBJECT: PSA 5009; Fi-Shock Inc., Electric Fence Control Circuit Boards; Model SS-750; Sample No. E-100-6808, Subsamples 1-23

REQUEST

PSA 5009 requests an evaluation of 23 circuit boards to determine if their constituent triacs had failed. Also, it requests that other failed components be identified and the consequence to the function of the controller be explained.

BACKGROUND

This PSA is a follow-up to previous safety assessments of the Fi-shock electric fence controller, model SS-750 (see PSA 4553 and 4607). During those investigations it was determined that the triac of the incident controller (a component of its circuit board) had short-circuited so as to offer continuous, boosted ac voltage to the controller's output terminals and therefrom to the fence perimeter wire. It was reported that the unit's fuses opened no matter how many times they were replaced each time the controller was energized. Out of apparent frustration by this, an uninformed consumer overamped the fuses four-fold, which permitted unpulsed voltage to prevail on the fence. Tragically, a child touched the fence and was electrocuted.

In order to determine if a pattern of defect exists, Compliance obtained 23 circuit boards identified by the manufacturer as defective. The components of focus are the triac and the metal-oxide varistor (MOV). The triac is an electronic switch that, under the influence of a timer circuit, "gates" line voltage in brief pulses to the controller's transformer (which boosts the voltage and conveys the pulses to the fence wire). Preceding the circuitry and placed after the fuses, the MOV is the altruistic sentry of the circuit. Allowing normal levels of current to pass, the MOV absorbs intense current surges generated from abrupt, erratic and occasional voltage transients that may harm other, more sensitive, components.

DISCUSSION

Each circuit board was tested and examined at ESEL. The tally of failed components and their effect are tabulated in the attached ESEL report. The results are

84

disaggregated and summarized as:

1) Twelve circuit boards had short-circuited triacs. The concomitant effect on the controller is immediate opening of the fuses each time it is plugged in (assuming the specified fuses are employed).

2) Two circuit boards showed short-circuited triacs and opened MOV's. Again, the result is opening of the fuses.

3) The MOV's of three boards were open with damage to no other components. Because some acutely intense voltage transients destroyed the MOV's as they defended more delicate components, the fuses, by their relative position, would also be expected to blow at the same instant. Upon replacing them, however, the controller would be expected to resume functioning. No direct adverse effects result from this particular MOV damage except that thereafter the controller's less sturdy components will be more vulnerable to voltage transients.

4) One circuit board exhibited an MOV that had shorted. In the same fashion as a shorted triac, a shorted MOV will result in immediate opening of the fuses.

5) Four circuit boards were found operational with no apparent defects.

6) One circuit board showed evidence that a consumer had attempted to repair or experiment with it. Both the MOV and the triac of this board were found operational.

CONCLUSION

ESEL determined that the predominant failure found among the circuit boards was the short-circuited triac (16 total). Fuses of the specified rating are expected to open immediately in response to this component malfunction. In those samples in which MOV's were the only failed component (with attendant fuse opening), fuse replacement would restore the unit's function but with added vulnerability to random voltage fluctuations. On those boards where the triac had shorted and the MOV had blown, an educated guess would venture that, in shielding the triac against a sudden voltage surge (as from lightning, but not necessarily), the demise of the MOV was insufficient to absorb all the augmented current. Hence, the triac was overwhelmed as well.

UNITED STATES GOVERNMENT

Memorandum

U.S. CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, D.C. 20207

TO : Ted Gordon, ESEE

DATE: FEB 16 1990

Through: Robert Garrett, ESEL RG
FROM : Ronald Reichel, ESEL RR

~~FOR OFFICIAL USE ONLY~~

SUBJECT: PSA #5009, Sample Number E-100-6808, Fi-Shock Inc., Electric Fence Control Boards, Model SS-750, Subs 1-23

Request:

The Engineering Laboratory was requested to test 23 control boards for triac shorts and any other circuit defects and then to note any effect that these component failures would have on a controller.

Test Results:

The 23 subsamples were tested using a Fluke 77 Multimeter with the following results:

	Triac		MOV			Effect on Controller	
Sub #	Short	OK	Blown	Short	OK	Would Blow Fuse	None
1	X				X	X	
2		X	X			X	
3	X				X	X	
4	X				X	X	
5	X				X	X	
6	X				X	X	
7	X		X			X	
8		X			X		X
9		X	X			X	
10		X		X		See note 2	
11	X		X			X	
12	X				X	X	
13	X				X	X	
14	X				X	X	
15		X	X			X	
16	X				X	X	
17	X				X	X	
18	X				X	X	
19	X				X	X	
20		X			X		X
21		X			X		X
22		X			X		X
23[1]		X			X	-	-

[1]Circuit altered by user before return to manufacturer.
[2]Leakage current should open fuse (not tested).

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Discussion:

Twenty-three control boards from Model SS-750 controllers, which were returned to Fi-Shock by customers, were tested for triac shorts and other circuit defects. Test results revealed 16 shorted triac's and 6 shorted or blown MOV's (Metal-Oxide Varistor's). The excess current drawn when either component fails should open one of the two 1/16 amp Slo-Blo fuses contained in the controller. Either fuse opening makes the controller inoperative.

Four control boards were found to be operational. The reason for replacing them was not determined.

Attachments

cc: K. Austin, ESEE

FOR OFFICIAL USE ONLY

PRODUCT SAFETY ASSESSMENT (PSA) TECHNICAL EVALUATION REQUEST

Note: Print, use black pen, no blue ink.

KA 1/22

Requested by: TM JONES Org. Codes: CACA FOCR

Date: 1/22/90 Priority: a (b) c d
A B C

Case# RP 89-87

1/23

PRODUCT INFORMATION

Manufacturer: FI - SHOCK INC. State: TN

Product: (generic name) CONTROL BOARDS (FOR CONTROLLER # 55-750)

Brand name, model, etc. PN 311-221

Sample number: E-100-6808

EVALUATION REQUESTED: 23 DEFECTIVE CONTROL BOARDS (PRINTED CIRCUIT BOARDS) HAVE BEEN PROVIDED TO CACA BY FIDO-SHOCK, INC. DETERMINE IF TRIAC ~~FAILED~~ OR IDENTIFY OTHER COMPONENT WHICH FAILED; INDICATE THE EFFECT EACH COMPONENT FAILURE WOULD HAVE ON THE CONTROLLER.

Hazard: ELECTRIC SHOCK / ELECTROCUTION
(describe hazard)

Requested date: 3/5/90 Attachments:

Note: SAMPLE AND FILE RP 89-87 WITH C.O.

PSA ACTION (FOR PSA USE ONLY)

Request number: 5009

Compliance no.: RP 89-87

Priority: b

Received: 1/23/90
(time/date)

Date Requested: 3/5/90

Due Date:

Mfg. FI-SHOCK INC

Product: control boards

Req'd. by: JONES Org. CACA

ASSIGNMENT:

Date: 1/23 Org: EI

Assigned to:

Req. Summary: FAILURE ANANLSIS OF CONT

Completed:

RTR Received 2-1-90 4:35 PM

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UNITED STATES GOVERNMENT

MEMORANDUM

U.S. CONSUMER PRODUCT
SAFETY COMMISSION
WASHINGTON, D.C. 20207

JAN 31 1990

TO : Robert Garrett, Branch Chief, ESEL
Through: James Bradley, Director, ESEL
Through: William King, Jr., Director, ESEE WHK
FROM : Ted Gordon, ESEE T. Gordon

SUBJECT: PSA 5009, Fi-Shock, Inc. Electric Fence Controller, Model SS-750, Sample No. E-100-6808, Subsamples 1-23

This PSA is a follow-up to a previous safety assessment of the SS-750 electric fence controller. During that assessment, it was determined that the incident controller's triac component had failed in such a way as to allow continuous ac voltage on the fence rather than pulsed ac voltage as designed. As a result, a child that touched the fence was electrocuted.

In order to establish whether a pattern of defect exists, Compliance obtained twenty-three faulty circuit boards from units that were returned to the manufacturer. Compliance requests that the boards be examined and the triac of each be tested. If time permits, please identify the faulty component of each circuit board where the triac was found operable. If such additional component failures are discovered, please note the loss of safety, if any, in each case. Because this is clearly a time consuming process, keep in mind that the triac of the boards are under immediate scrutiny at this time. Should expediency become necessary, examination of the triacs should have priority over all other components until countervailing evidence of another pattern of defect indicates otherwise.

Compliance requests a full report by March 5. In order to comply with this date, I will need a lab report by February 26, 1990. I also request the opportunity to participate in the evaluation of the boards, even if only to observe.

Attachments

Amended TG 2-5-90

ATTACHMENTS

1. PSA Request No. 5009
2. Copy UL Listing Report on Fi-Shock Controllers with Schematics
3. Copy PSA Report No. 4607, the Initial Safety Assessment

Fi-Shock inc.
FAX - 615-673-4770
Phone - 615/524-3780
5360 NATIONAL DRIVE • KNOXVILLE, TENNESSEE 37914

January 15, 1990

Tim Jones
U.S. Consumer Product Safety Commission
Corrective Actions Division
5401 Westbard Ave. Room 230
Washington, D.C. 20207

Subject: CPSC RP 89-87 FIDO-SHOCK PET DETERRENT

Dear Mr. Jones:

Per your letter dated 12-13-89, I have enclosed 23 (311-221) control boards that were removed from the model No. SS-750 controllers returned to Fi-Shock Inc., from customers.

As of January 2, 1990, there was a grand total of 23 control boards in our repair center depot that had been removed and replaced in customer returned SS-750 controllers. The preliminary failure analysis of the 23 control boards is as follows:

14 - Timer closed (locked in the on position) (some varistors damaged).
2 - Varistor shorted.
6 - Operational (some varistors damaged).
1 - Circuitry had been tampered with (some components had been changed, obviously in an attempt to repair the control board).

Therefore, these 23 control boards are being shipped to the CPSC for evaluation and disposition as seen appropriate by the CPSC with respect to this particular investigation. Likewise, we will continue to send the CPSC any defective control boards found in the SS-750 controllers returned by consumers, for an indefinite future period. If you have any questions after receiving the enclosed control boards, then please give me a call.

Finally, with repect to your request concerning the manufacturer, it is our desire not to involve the control board manufacturer at this particular time for the following reasons:

1) The manufacturer is under contract with FI-Shock to fabricate, test and supply the control board ready for use.

2) They manufacture the board to our specifications only and make no changes to the board without our approval.

3) With respect to the repair of suspected defective boards, they are under contract to test and repair any contrcl boards found defective. The repaired boards are then returned to FI-Shock for final disposition. On the other hand, boards that can not be repaired are to be disposed of. Any information concerning the repair of these boards (defective components) can be readily obtained by FI-Shock and then passed on to CPSC if desired. I might add that the control board repair data (field use boards only) has been in effect since we have initiated the repair of such boards.

4) This company not only manufactures control boards for Fi-Shock, it also manufactures control boards (not similar to our 311-221) and in some cases the entire electric fence controller for some of our competitors.

5) The president of this company has been in the electrical fence controller business for about 30 years. Therefore, he not only has business but friendship relationships with many of our competitors. With this in mind, should he become aware of the CPSC investigation of our SS-750 controller, consequently our competition may become aware. Thus, in our highly competitive market, everyone is looking for an edge on the competition and the possibility would exist for them to use the CPSC investigation to their advantage.

In conclusion, I hope all of the above information sufficiently answers your last letter. Should you need additional information, please contact me.

Very Truly Yours,
Fi-Shock Inc.

Danny McCarter
Chief Engineer

DM/rb

cc: CPSC Central Regional Center
230 South Dearborn St. Room 2944
Chicago, IL. 60604

(R-3)

~~FOR OFFICIAL USE ONLY~~ ~~FOR OFFICIAL USE ONLY~~ 93

PRODUCT SAFETY ASSESSMENT (PSA) TECHNICAL EVALUATION REQUEST

Note: Print, use black pen, no blue ink.

KA 1/22

Requested by: TIM JONES Org. Codes: CACA FOCR

Date: 1/22/90 Priority: a (b) c d (A B C)

Case# RP 89-87

1/22

PRODUCT INFORMATION

Manufacturer: FI - SHOCK INC. State: TN

Product: (generic name) CONTROL BOARDS (FOR CONTROLLER # SS-750)

Brand name, model, etc. PAC 311-221

Sample number: E-100-6808

EVALUATION REQUESTED: 23 DEFECTIVE CONTROL BOARDS (PRINTED CIRCUIT BOARDS) HAVE BEEN PROVIDED TO CACA BY FIDO - SHOCK, INC. DETERMINE IF TRIAC FAILED OR ANY OTHER COMPONENT WHICH FAILED; INDICATE THE EFFECT EACH COMPONENT FAILURE WOULD HAVE ON THE CONTROLLER.

Hazard: ELECTRIC SHOCK / ELECTROCUTION
(describe hazard)

Requested date: 3/5/90 Attachments:

Note: SAMPLE AND FILE RP 89-87 WITH C.O.

PSA ACTION (FOR PSA USE ONLY)

Request number: 5009

Compliance no.: RP 89-87

Priority: b

Received: 1/23/90 (time/date)

Date Requested: 3/5/90

Due Date:

Mfg. FI-SHOCK INC

Product: control boards

Req'd. by: JONES Org. CACA

ASSIGNMENT:

Date: 1/23 Org: EI

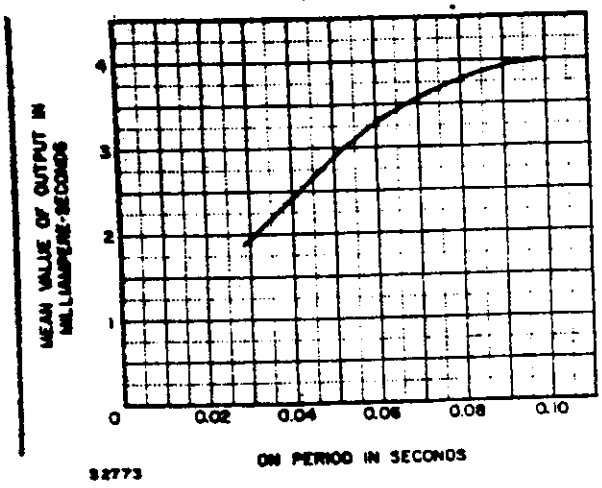
Assigned to:

Req. Summary: FAILURE ANANLSIS OF CONT

Completed:

~~FOR OFFICIAL USE ONLY~~

FIGURE 22.1
MAXIMUM ACCEPTABLE OUTPUT OF A PEAK-DISCHARGE-OUTPUT CONTROLLER[a]



[a]See Figure 22.3 for on-period values less than 0.03 second.

FIGURE 22.2
MAXIMUM ACCEPTABLE OUTPUT OF A PEAK-DISCHARGE-OUTPUT CONTROLLER

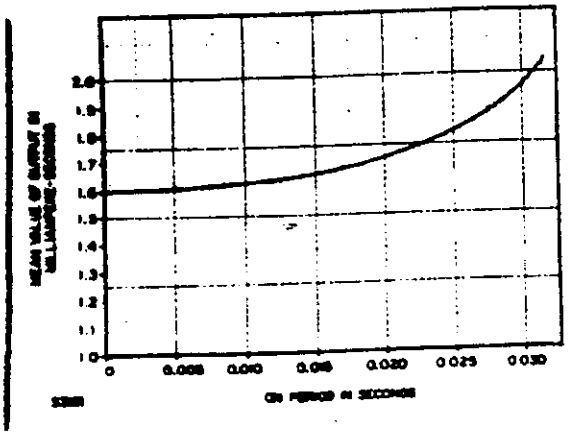
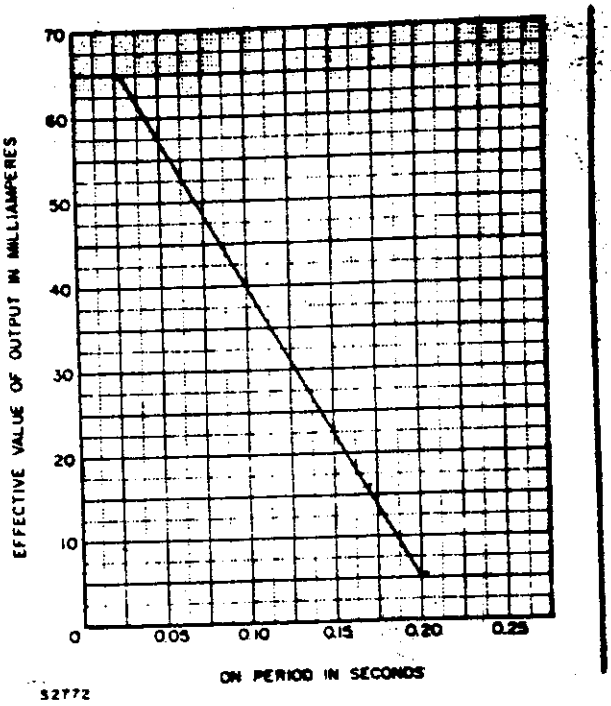


FIGURE 22.3
MAXIMUM ACCEPTABLE OUTPUT OF A SINUSOIDAL-OUTPUT CONTROLLER



22.6 In any test involving a load on a fence controller, the load on the secondary output circuit is to be a noninductive resistance capable of being varied to produce maximum output or minimum off-period of the fence controller. The load is to be not less than 500 ohms, including the measuring device, and capacitance may be used in parallel with the resistance load provided the capacitance increases to any extent the output-current on-period or voltage, or decreases the length of time of the off-period.

AUTOMATIC TELEFACSIMILE TRANSMISSION FORM

1. FROM: Ron Reichel
(Name) (Organization Code)

2. TO: Tim Jones, Rm. 236, CACA 492-6608
(Name) (Organization Code)

3. NUMBER OF PAGES TRANSMITTED 2+ cover

4. SUBJECT Controllers - Fi-Shock Inc.

5. TRANSMITTED BY Karen 2/2/90
(Name) (Date)

IMPORTANT! Before transmitting any documents to automatic telefacsimile equipment, please provide the requested information in Boxes 1-4. This information is required by the receiving office to properly route incoming documents.

Fi-Shock inc. FAX · 615-673-4770 Phone · 615/524-3780
5360 NATIONAL DRIVE • KNOXVILLE, TENNESSEE 37914

January 15, 1990

Tim Jones
U.S. Consumer Product Safety Commission
Corrective Actions Division
5401 Westbard Ave. Room 230
Washington, D.C. 20207

Subject: CPSC RP 89-87 FIDO-SHOCK PET DETERRENT

Dear Mr. Jones:

Per your letter dated 12-13-89, I have enclosed 23 (311-221) control boards that were removed from the model No. SS-750 controllers returned to Fi-Shock Inc., from customers.

As of January 2, 1990, there was a grand total of 23 contr boards in our repair center depot th had been removed a replaced in customer returned SS-750 llers. The preliminary failure analysis of th 23 control boards is a follows:

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2 - Varistor shorted.
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Finally, with repect to your request concerning the manufacturer, it is our desire not to involve the control board manufacturer at this particular time for the following reasons:

1) The manufacturer is under contract with FI-Shock to fabricate, test and supply the control board re dy for use.

Fi-Shock inc.

2) They manufacture t: board to our specifications only and make no changes to the board without our approval.

3) With respect to the repair of suspected defective boards, they are under contract to test and repair any control boards found defective. The repaired boards are then returned to FI-Shock for final disposition. On the other hand, boards that can not be repaired are to be disposed of. Any information concerning the repair of these boards (defective components) be readily obtained by FI-Shock and then passed on to CP desired. I might add that the control board repair (field use boards only) has been in effect since we initiated the repair of such boards.

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5) The president of this company has been in the electrical fence controller business for about 30 years. Therefore, he not only has business but friendship relationships with many of our competitors. With this in mind, should he become aware of the CPSC investigation of our SS-750 controller, consequently our competition may become aware. Thus, in our highly competitive market, everyone is looking for an edge on the competition and the possibility would exist for them to use the CPSC investigation to their advantage.

In conclusion, I hope all of the above information sufficiently answers your last letter. Should you need additional information, please contact me.

Very Truly Yours,
Fi-Shock Inc.

Danny McCarter
Chief Engineer

DM/rb

cc: CPSC Central Regional Center
230 South Dearborn St. Room 2944
Chicago, IL. 60604

(R-3)

UNITED STATES GOVERNMENT RESTRICT

MEMORANDUM

U.S. CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, D.C. 20207

AUG 23 1989

TO : Timothy Jones, CACA
Through: Frank E. Brauer, EXPB
Through: William King, Jr., Director, ESEE
FROM : Ted Gordon, ESEE

SUBJECT: PSA 4607; Fi-Shock, Inc.; Electric Fence Controller, Model SS-750; Sample No. K-830-2929; IDI 881115CCC2060

REQUEST

PSA 4607 requests an engineering evaluation of the subject sample to identify the defect that resulted in the electrocution of a child.

BACKGROUND

DETAILED DESCRIPTION

The Fido Shock electric fence controller, model SS-750, is a device that supplies pulsed ac-voltage to an exposed metal wire suspended around the periphery of an enclosed area. Its essential components consist of a circuit board with a digital oscillator (to provide timing for the pulses), a transformer to boost the voltage to the output, and two 1/16 ampere time delay fuses.

Employed conjunctively with the oscillator, a device known as a triac is an important element to this safety assessment. The triac behaves in essence as a switch in response to the recurrent, evenly timed, low-voltage dc pulses impressed upon it by the oscillator. During each oscillator signal, the triac transmits 120-volt ac line voltage to the input of the unit's transformer, which instantaneously amplifies it at the fence (output) terminals to 800-1000 volts. When the oscillator signal ends (within about 170 milliseconds) the triac's conductivity abruptly terminates, effectively blocking all line voltage to the transformer until the next oscillator signal about 1.2 seconds later. This process continues as long as the unit is energized and is the sole function of fence controller, providing high voltage in brief pulses to the fence wire.

The specified fuses of the fence controller are of the time delay type and are rated 1/16 ampere. The time delay characteristic resists nuisance opening of the fuses in response to the fleeting inductive current transients that are invariable with electromagnetic devices (as transformers). The gossamer filament of the fuse, on the other hand, cannot long withstand current of a duration beyond the prescribed pulse interval. Therefore, any defective condition causing a distended pulse duration (or, in the extreme, the complete loss of triac control resulting in continual voltage input to the transformer) will consequently open the fuses.

REST

INCIDENT

IDI 881115-CCC-2060 reports that the consumer who purchased the incident sample found after installing it that the time delay fuses immediately opened when the fence controller was energized. After repeatedly changing the fuses with those of the specified rating, the consumer replaced them with fuses rated at a current four times greater--1/4 ampere. Thereafter, the unit reportedly remained operational. At some time later, a child on the premises was found unconscious in contact with the energized fence wire. He was later pronounced dead, killed by apparent electrocution.

DISCUSSION

TESTING AND RESULTS

Engineering received the incident unit in an inoperable condition; that is, with no transformer output voltage. Two distinct, isolated coils of wire, each wound around a segment of a laminated steel core, comprise the transformer. One coil (the primary coil) receives input voltage from a 120 V receptacle and the other (the secondary coil) supplies the boosted output voltage to the fence wire. The transformer was found to be failed with no voltage at the secondary terminals.

Taking advantage of components of a new fence controller in our possession, the failed transformer of the incident unit was replaced by a new, functioning one. Immediately upon energizing the now renovated unit, the fuses opened (as the complainant had reported). In order to test further and observe its operation, it was necessary to overfuse the unit. With the new transformer and the overrated fuses in place, the unit's output terminals exhibited a continual ac-voltage near 900 volts demonstrating that, through some malfunction of the timing circuit board, the pulsing function of the oscillator was disabled. Thus, a potentially lethal, uninterrupted current source was available to the fence wire. (Through a 513 ohm resistor, this current was measured 11 milliamperes). Further testing revealed that it was specifically the triac that had failed. It no longer cycled on and off in response to the oscillator signal, but indefinitely and uncontrollably conducted line voltage to the transformer from which it is amplified about eight times and conveyed to the fence terminals.

The testing proceeded by operating the unit in this continual state through the resistor for about 20 minutes after which time the current output decreased to 2.4 milliamperes. This reduction in current reflects the gradual degeneration of the new transformer as a result of the imposed continuous voltage--rather than the pulsed voltage for which it was designed. This helps to explain the failed condition of the transformer found in the incident unit.

A DESIGN CONCERN

With respect to the triac failure under discussion, the design of the unit enables a prompt, safe response in the abrupt opening of the fuses. To help ensure and maintain this safety feature, labels are present on the unit's exterior strongly enjoining against employing other fuses than those specified and against altering in any way the product's configuration. Although these steps may be a responsible, reasonable effort to protect the public and minimize culpability in the event of a tragic incident, Engineering Sciences favors a more paternalistic approach by the manufacturer and Underwriter's Laboratories.

Described previously, the specified fuses are 1/16 ampere, time delay fuses that are intended to satisfy two opposing objectives: to resist nuisance tripping in response to inevitable (and permissible) high current transients, while opening promptly in response to dangerous conditions generated by a malfunction. Currently permitted under UL 69 (entitled "Electric Fence Controllers"), the Fi-Shock unit's fuses are consumer serviceable, easily accessible within external fuse holders. It is the contention of Engineering Sciences that, with the nuisance trip protection in force by virtue of the fuses's time delay property, any and all sources of fuse opening should be regarded with all caution and seriousness given the nature of this product's output. Specifically, any opening of the fuse may realistically be viewed as emanating from some defect requiring professional repair and not as an innocuous, isolated foible that can be dismissed casually. Accordingly, the unit's fuses should more appropriately be situated within its enclosure (with the rest of the circuitry), ensconced and protected against replacement with arbitrarily overrated fuses for the mere sake of convenience. As the reported incident painfully demonstrates, labels and warnings notwithstanding, it is conceivable for a fault condition and ill-advised initiative by a consumer to converge to create a tragic mishap.

CONCLUSION

The evaluation of the Fi-Shock electric fence controller reveals that the electrocution occurred as a result of consumer error in conjunction with a failed electronic component. Consumer error lead to the circumvention of the fail-safe feature inherent in the device by replacing the specified fuses with those of a four-fold higher rating. The failure of the triac (the likelihood of which ESEE has no information) disabled the pulsed voltage output, permitting a potentially lethal continual ac-voltage on the wire fence.

Engineering Sciences believes, with regard to this product, that a technical issue is brought to light: For a product whose sole function is to convey high voltage and moderately high current to an exposed wire in a populated area, it is desirable to seal the fuses against consumer tampering. This position is taken under the assumption that the fuse capacity and the time delay property are effective against nuisance opening. It would follow, then, that all incidents of fuse openings should be considered arising from a defect requiring factory service. Hence, consumer accessibility to the fuses is inappropriate and presents an unnecessary risk. It would seem appropriate to situate the fuses within the controller enclosure with a label indicating "no user serviceable parts inside".

U. S. CONSUMER PRODUCT SAFETY COMMISSION

SAMPLE COLLECTION REPORT

1. SAMPLE TYPE	2. FLAG	3. SAMPLE NUMBER
[X] A. OFFICIAL [ ] B. NON-OFFICIAL [ ] C. DOCUMENTARY	Sample collection as follow up to IDI 881115CCC2060	K-830-2929

4. COLLECTING OFFICE	5. HOME A. O.	6. ASSIGNMENT NO.	7. DATE OF COLLECTION	8. PRODUCT CODE
NSH	FOCR		07-11-89	0605

9A. PRODUCT NAME	9B. MODEL
Fido Shock Pet Deterrent	SS-750

10A. MANUFACTURER'S	10B. IDENTIFICATION NO.	11A. SENT BY ORG.	11B. SENT TO ORG.	11C. DATE SENT
Fi-Shock Inc.		NSH	CACA	07-12-89

12. OTHER PRODUCT IDENTIFICATION DATA

Product is a small box encased in hard black plastic. The yellow lable reads in part: Fido-Shock, Solid State Pet Deterrent. Serial Number is G-04346, product is made by Fi-Shock Inc., 5360 National Drive, Knoxville, Tennessee 37914.

13A. REASON FOR COLLECTION-SUSPECTED VIOLATION: [ ] FHSA [X] CPSA [ ] FFA [ ] FPPA [ ] RSA

13B. ANALYSIS NEEDED-DOC REF.

Reference RP 89-87
Test for operating performance

14. MANUFACTURER	15. SHIPPER	16. DEALER
Fi-Shock Inc. 5360 National Drive Knoxville, Tennessee 37914	N/A	Lowe's Building & Supply Clarksville, Tennessee

17. SIZE OF LOT SAMPLED	18. EST. VAL. OF LOT AFTER SAMPLING	19. COST OF SAMPLE	20. DATE SHIPPED & DOC. REF.
N/A	N/A	N/C	N/A

21. SUPPORTING DOCUMENTS ATTACHED

21A. INVOICE NO. & DATE	21B. SHIPPING RECORDS NO. & DATE
N/A	N/A

21C. AFFIDAVIT SIGNER'S NAME, TITLE, & DATE: Kim Phillips, Housewife, 07-11-89

22. SAMPLE SIZE, METHODS OF COLLECTION & PREPARATION

Sample was give to reporting investigator by Mrs. Kim Phillips. Sample was secured until identified and marked. Item was marked as shown at block #23. Item shipped via US Mail.

23. IDENTIFICATION ON SAMPLE	24. IDENTIFICATION ON SEAL
K-830-2929, Sub 1, 07-11-89, DMG	K-830-2929, D.M. Galanti, 07-12-89

25A. SAMPLE DELIVERED TO	25B. DATE	26. ORIGINAL REPORT/RECORDS SENT TO
US Mail	07-12-89	FOCR

27A. LABORATORY (1)	27B. LABORATORY (2)
Tim Jones (CACA)	

28. REMARKS

MIS:32626

Attachments: Affidavit of Mrs. K. Phillips giving the product to US CPSC, and official receipt for sample executed by Mrs. Phillips.

Sample will not be returned to Owner.

29. RELATED SAMPLES: None

30A. COLLECTOR'S NAME & TITLE	30B. COLLECTOR'S SIGNATURE & DATE
David M. Galanti, PSI	David M. Galanti 07-12-89

31A. REVIEWER'S NAME & TITLE	31B. REVIEWER'S SIGNATURE & DATE
Henry Simpson, Acting SPSI	Henry A. Simpson 7/17/89

32. TIME EXPENDED:

A. LINE FORCE ACTIVITY	2.0
B. MANAGEMENT	0.5
C. SUPPORT	
D. TOTAL	2.5
E. TRANSIT	2.0

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CPSC FORM 166 (REVISED 9-76)

U.S. CONSUMER PRODUCT SAFETY COMMISSION	1. AREA OFFICE ADDRESS Nashville Resident Post. US CPSC P.O. Box 1028 Nashville, Tennessee 37220	
2. NAME OF INDIVIDUAL Kim Phillips	3. TITLE OF INDIVIDUAL N/A	4. DATE 07-11-89
5. FIRM NAME N/A		6. SAMPLE NUMBER K-830-2929
7. NUMBER AND STREET 2499 Dividing Ridge Road	8. CITY AND STATE (Include Zip Code) Goodletsville, Tennessee 37072	

9. SAMPLES COLLECTED (Describe fully. List lot, serial, model numbers and other positive identification)

The following samples were collected by the Consumer Product Safety Commission pursuant to Section 27(f) of the Consumer Product Safety Act (15 U.S.C. 2076(f)) and/or Section 11(b) of the Federal Hazardous Substances Act (15 U.S.C. 1270(b)) and/or Sections 5(c) and (d) of the Flammable Fabrics Act (15 U.S.C. 1194(c) and (d)) and/or Section 704(c) of the Federal Food Drug and Cosmetic Act (21 U.S.C. 374(c)) [Authority for sample collections made in connection with the Poison Prevention Packaging Act of 1970 (15 U.S.C. 1471 et seq.)], and receipt for said samples is hereby acknowledged. Sections cited are quoted on the reverse side of this form.

One Fido Shock Pet Deterrent Electric Fence Controller., Serial Number G-04346, Model Number SS-750. Manufactured by Fi-Shock Inc., 5360 National Drive, Knoxville, Tennessee, 37914. Item was given to US CPSC for testing and will not be returned to owner. XXNOTHING FOLLOWSXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

10. SAMPLES	11. SAMPLES WERE	12. COLLECTOR
a. AMOUNT RECEIVED FOR SAMPLE $ N/A	N/A ☐ PURCHASED	a. NAME (Print or type) David M. Galanti, PSI
b. SIGNATURE (Person from whom sample received)	☐ BORROWED (To be returned)	b. SIGNATURE

103

CPSC FORM NO. 161 RECEIPT FOR SAMPLES

AFFIDAVIT	SAMPLE NO. K-830-2929
STATE OF TENNESSEE	COUNTY OF Robertson

Before me, David M. Galanti, PSI, a duly authorized employee of the Consumer Product Safety Commission, appropriately designated by the Chairman of said Commission pursuant to provisions of the Consumer Product Safety Act (sec. 27 (b)(2), 86 Stat. 1228; 15 U.S.C. 2076 (b)(2)), to administer or take oaths, affirmations, and affidavits, personally appeared Kim Phillips in the county and State aforesaid, who, being first duly sworn, deposes and says: I Am The Wife Of Walter Phillips And I Live at 2944 Dividing Ridge Road, Goodlettsville, TN. I have given Mr. David M. Galanti the Fido-Shock Pet Deterrent, Serial # G-64346, model # 55750, electric Controller. This is the same Controller that was used when my nephew was accidentally killed in Sept 1988. This Controller has not been altered, or used, since the Accident and it has been stored inside of a shed outside the house. I understand that this Controller will not be returned by the U.S. C.P.S.C. Mr. Galanti has written this Affidavit for me As he Discussed its contents. I have read, understand and agree with the statement.

AFFIANT'S SIGNATURE & TITLE

Kim Phillips Homeowner

FIRM *(Name and address, include ZIP Code)*

2944 Dividing Ridge Rd
Goodlettsville, TN

Subscribed and sworn to before me at Ridge Top, Tennessee *(City and State)*

this 11th day of July, 19 89.

David M. Galanti
(Employee's Signature)

EMPLOYEE OF THE CONSUMER PRODUCT SAFETY COMMISSION ACTING IN ACCORDANCE WITH AUTHORITY GRANTED IN THE ABOVE STATED DECLARATION.

CPSC FORM NO. 158

104

UNITED STATES GOVERNMENT

MEMORANDUM

RESTRICT

U.S. CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, D.C. 20207

JUL 20 1989

TO : Timothy Jones, CACA
Through: Frank E. Brauer, EXPB
Through: William King, Jr., Director, ESEE
FROM : Ted Gordon, ESEE T. Gordon

SUBJECT: PSA 4553; Fi-Shock, Inc., Electric Fence Controller; Fido-Shock Pet Deterrent, Model SS-750; Sample Number E-100-5709; IDI 881115-CCC-2060

REQUEST

PSA 4553 requests an evaluation of the new unit of the subject product (the incident sample is presently unavailable for examination) to determine if its electric output is consistent with the parameters listed in the given UL test report. In addition, an assessment of the shock hazard is requested.

BACKGROUND

The Fido-Shock Pet Deterrent is an electric fence controller for a wire suspended on posts around the perimeter of an area intended to confine pets by inflicting electric shocks. The controller draws power from a 120-volt outlet and is comprised of a timing circuit and a transformer that reportedly boosts the output voltage to 800 volts (plus or minus 200 volts). The transformer's output current is rated about 12 milliamperes (rms), and the unit is protected by two time-delayed fuses rated 62.5 milliamperes. The timing circuit is composed of several semiconductor components and an integrated microprocessor. A triac--a semiconductor switching component--relays the 120-volt AC power to the input of the transformer in intermittent AC pulses. The ratio of the time interval during which the voltage is on to that during which it is off is intentionally low so that a wide safety margin is established. This low duty cycle is crucial, in the event of accidental exposure, in protecting against heart fibrillation and involuntary muscle contraction, which is more likely for continual, high AC-current.

The fence controller has two terminals. The ground terminal is electrically connected to a metal stake in the ground, and the fence terminal is connected to the wire suspended on plastic posts around the area of enclosure. This is an incomplete circuit until an animal or other, conductive object comes into contact with the energized wire and the ground. Thus, the animal closes the circuit and briefly becomes part of the current path.

IDI 881115-CCC-2060 reports that a child was electrocuted after falling onto a wire perimeter connected to the model SS-750 Fido-Shock Pet Deterrent. A police examination of the incident unit revealed that it contained fuses rated 250 milliamperes--four times greater than that specified by the manufacturer. The owner of the fence claimed that the overrated fuses were necessary to make the fence operable because the recommended fuses opened invariably each time the unit was energized.

DISCUSSION

UL 69, the governing standard of electric fence controllers, is concerned with two primary parameters relating to safety. The first is the pulse duration, which in UL nomenclature is called the "on-period", and the second is the effective, or rms, current. The on-period is specifically defined as the time from which the AC pulse initially exceeds 5 milliamperes until it falls below 5 milliamperes at the end of the pulse. Effective current, which is essentially a mathematical designation used to compute average power, is numerically related to current amplitude of a sine wave as "amplitude divided by the square root of two". UL defines a relationship between these two quantities whereby a limit is imposed upon the rms current based upon the duration of the on-period. Broadly speaking, a higher current is permissible only in conjunction with a shorter on-period, and conversely a lower current may be compensated for by a relatively longer on-period. The UL-imposed upper limit for the on-period is 0.20 second and the time between pulses (the off-period) must be at least 0.90 second.

TESTING:

The purpose of the testing was to obtain the parameters of the fence controller output in order to determine its consistence with the attached UL listing report and, moreover, to ascertain its compliance with the provision of UL 69 pertaining to voltage and current output. The pertinent parameters are the on-period, the effective current (through a 500-ohm, or greater, resistance), and the off period.

The output pulse was observed on an oscilloscope, which provides definitive information about waveform, amplitude and period. With a 513-ohm resistance across the terminals of the fence controller, a 16.5 milliampere rms current was measured. This is in excess of the 12 milliamperes reported by the manufacturer. Voltage, which is not a critical parameter in this evaluation, was measured on a Beckman multi-meter to be about 1400 volts. This is above the expected voltage output of 800 volts (plus or minus 200 volts), as reported by the manufacturer. The on-period was measured at 0.174 second, and the off-period was determined to be 1.16 second.

Based on these results, the fence controller is in compliance with UL 69. Although the current output is 16.5 milliamperes (exceeding the reported 12 milliamperes), this is an acceptable level because the on-period falls within the 0.175 second limit as established by UL's imposed relationship between the current and the on-period. The output voltage of about 1400 volts (significantly higher than the expected 800 + 200 volts), does not appear to play a role in UL 69 because this product exhibits the characteristics of a constant current generator (meaning that approximately the same current is incurred by all bodies completing the electric fence circuit independent of body impedance), and therefore current limitations are of essential concern. Finally, the off-period between pulses of 1.16 seconds exceeds the minimum duration of 0.90 second, and the on-period of 0.174 second is below the maximum of 0.20 second, both in compliance with UL's provisions.

DISCUSSION OF INCIDENT:

UL, as part of its testing regimen, subjects fence controllers to an "unreliable component test". This test involves overriding select components in the circuit (to simulate a failure) and monitoring the resulting output. One prominent component, the triac, is a switching device that "gates" the line voltage in pulses to the transformer in response to the timing circuit. When the triac is short-circuited, the output is no longer governed by the timing circuit, and a continual, uninterrupted AC-voltage is present across the output terminals. The unit tested by UL responded to the overriding of the triac by the opening of its fuses. UL considers this result acceptable because the unit failed in a safe manner. As unsolicited conjecture (yet an important observation), the repeated opening of the incident unit's fuses may have been the appropriate response to a triac failure. In overfusing the unit by four-fold, the fence's owner circumvented the unit's inherent safe response to this (speculated) defect and established a potentially lethal continuous AC-voltage on the fence. In short, some malfunction of the installed system was apparent by the repeated action of the fuses, and the tragically grim consequence points to the triac as the possibly failed component.

CONCLUSION

Speculation aside, the subject sample, although deviating from the parameters of the attached UL listing report, does comply with UL 69 governing electric fence controllers with respect to electric output and therefore, assuming properly rated fuses, is not expected to pose a hazard.

~~RESTRICTED~~ 6/13/89

PRODUCT SAFETY ASSESSMENT (PSA) TECHNICAL EVALUATION REQUEST
Note: Print, use black pen, no blue ink.

Requested by: TIM JONES 6/13 Org. Code: CACA Reg. Off.: FOCA

Date: 6/13/89 Priority: a b (b) c d

A B C

ID#
RP# 89-87
CA#
FH#

PRODUCT INFORMATION

Manufacturer: EI-SHOCK, INC. City/State: KNOXVILLE, TN. Zip: 37914

Product (generic name): ELECTRIC FENCE CONTROLLER

Brand name, model, etc.: FIDO-SHOCK PET DETERRENT, MODEL SS-750

Sample number: E-100-5709

EVALUATION REQUESTED: 881115CCC2060, WHICH INVOLVES THE ELECTROCUTION OF 4 YR. OLD BOY, INITIATED THIS 15(b) REPORT. PLEASE CONFIRM THAT THE ELECTRICAL OUTPUT RATINGS OF THE CONTROLLER SUPPLIED BY THE FIRM ARE CONSISTENT WITH THE UL TEST REPORT PROVIDED. ALSO, INDICATE IF THIS PULSED ELECTRIC ENERGY OUTPUT IS SAFE, I.E., IS NOT A SEVERE ELECTRIC SHOCK NOR AN ELECTROCUTION HAZARD.

Hazard: ELECTRIC SHOCK / ELECTROCUTION (describe hazard)

Requested date: JULY 25, 1989 Attachments: NONE / SEE T. JONES

NOTES: 1) RP 89-87 AND SAMPLE NO. E-100-5709 ARE WITH THE C.O.

2) NEITHER THE CONSUMER'S CONTROLLER NOR ANY ANALYSIS REPORT OF THE CONSUMER'S UNIT ARE AVAILABLE TO CACA NOW. WE ARE TRYING TO OBTAIN THESE.

PSA ACTION (FOR PSA USE ONLY)

Request number: 4553 (1)
Compliance no.: RP89-87 (2)
Priority: b (3)
Received: 6/14/89 (time/date) (4)
Received by: (5)
Date Requested: 7/25/89 (6)
Due Date: (7)
Mfr: EI-SHOCK, INC (8)
Product: electric fence controller (9)
Req'd. by: JONES of: CACA (10)

ASSIGNMENT:
Date: 6/14 Org: EI (11)
Assigned to: (12)
Req. Summary: ASSESS ELECTRIC SHOCK POTENTIAL (13)
Completed:

1/84

~~DESTROYED~~

101

PRODUCT SAFETY ASSESSMENT (PSA) TECHNICAL EVALUATION REQUEST
Note: Print, use black pen, no blue ink.

Requested by: TIM JONES (1) Org. Code: CACA Reg. Off.: FOCP

Date: 6/13/89 Priority: a b (c) d
A B C

ID#
RP# 89-87
CA#
FH#

PRODUCT INFORMATION

Manufacturer: FI-SHOCK, INC. City/State: KNOXVILLE, TN. Zip: 37914

Product (generic name): ELECTRIC FENCE CONTROLLER

Brand name, model, etc.: FIDO-SHOCK PET DETERRENT, MODEL SS-750

Sample number: E-100-5709 (5)

EVALUATION REQUESTED: 881115CCC2060, WHICH INVOLVES THE ELECTROCUTION OF 4 YR. OLD BOY, INITIATED THIS (56) REPORT. PLEASE CONFIRM THAT THE ELECTRICAL OUTPUT RATINGS OF THE CONTROLLER SUPPLIED BY THE FIRM ARE CONSISTENT WITH THE UL TEST REPORT PROVIDED. ALSO, INDICATE IF THIS PULSED ELECTRIC ENERGY OUTPUT IS SAFE, I.E., IS NOT A SEVERE ELECTRIC SHOCK NOR AN ELECTROCUTION HAZARD.

Hazard: ELECTRIC SHOCK / ELECTROCUTION
(describe hazard)

Requested date: JULY 25, 1989 Attachments:

PSA ACTION (FOR PSA USE ONLY)

Request number: (1)
Compliance no.: (2)
Priority: (3)
Received: (4)
(time/date)
Received by:
Date Requested: (5)
Due Date: (6)
Mfr: (7)
Product: (8)
Req'd. by: Org: (10)

ASSIGNMENT:

Date: Org: (11)
Assigned to: (12)
Req. Summary: (13)

Completed:

NOTES: 1) RP 89-87 AND SAMPLE NO. E-100-5709 ARE WITH THE C.O.

2) NEITHER THE CONSUMER'S CONTROLLER NOR ANY ANALYSIS REPORT OF THE CONSUMER'S UNIT ARE AVAILABLE TO CACA NOW. WE ARE TRYING TO OBTAIN THESE.

9/84

MEMORANDUM OF TELEPHONE CALL

Date 1/8/90

Time

Firm Name: Fl-Slot Inc.

Firm Address: Knoxville, Tenn

Caller Name & Title: Don McCarter, Chief Engineer

Telephone Number: (615) 524-7380

Subject: RP 89-87 12/20/89 letter (CPSC)

CACA Contact: Tim Jones

Mr. McCarter said he would send us 23 circuit boards he had in stock, half of which were open circuited and half welded closed (continuous current).

Mr. McCarter said he would not, for now, identify the contract manufacturer of these circuit boards. He said that the president (owner) was a good friend of one of his competitors.

Mr. McCarter said he wanted to know where this investigation was going. I said I couldn't comment,

Copy to:

except that the concern related to the triac used in his SS-750 controller and whether there i...

MEMORANDUM OF TELEPHONE CALL

Date 12/13/89

Time

Firm Name: Ei - Stork, Inc.

Firm Address: Knoxville, Tennessee

Caller Name & Title: Dan McCarter, Chief Engr.

Telephone Number: (615) 524-7380

Subject: RP 89-87 / SS-750 Controller

CACA Contact: Tim Jones

Mr. McCarter said that the Model SS-750 Net Deterrent controller was the only controller Ei Firm made that used the triac. All others used the SCR switch. I requested that all defective circuit boards for this controller that were replaced be shipped to CHSC for further examination, for an indefinite period.

Mr. McCarter said he had no problem with that. He said that he wasn't sure what the subcontractor of the circuit boards did with returned (defective boards). He said that was their responsibility, but that either they were

Copy to:

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MEMORANDUM OF TELEPHONE CALL

Date 10/16/89

Time

Firm Name: Fi-Shek Inc

Firm Address: Knoxville, Tn. 37914

Caller Name & Title: Dan McCarter, Chief Engineer

Telephone Number: 615-524-7380

Subject: RP 890087 9/14/89 letter.

CACA Contact: Tim Jones

Mr. McCarter said that he had drafted up a response to our 9/14/89 letter, and would send out the response early next week. Mr. McCarter said that he was waiting for additional info. on the service reports to answer question 2 and 3. Essentially, he said that specific info. on the trucks would not be available since the service reports would only show defective circuit boards and replacement, that would not address specific component failures (like the triac) on the PCB.

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10/26/89

Mr. McCarter called and said he was going to mail the response.

ROUTE SLIP

TO: Eric

re: Fi-Shock response

- [ ] Take necessary action
- [ ] Approval or signature
- [ ] Comment
- [ ] Prepare reply
- [ ] Discuss with me
- [x] For your information
- [ ] See remarks below

FROM: Clem

DATE: 11/21/81

REMARKS

The firm didn't provide any service records, but then their records only show the circuit boards being replaced, not the triacs. Please note that UL 69 appears to be inadequate re warnings for fuse replacement other than ~~the rated~~ per its rating, i.e. - it addresses only to fire hazard, not electric shock hazard.

(113)

CPSC FORM 108 9/73

MEMORANDUM OF TELEPHONE CALL

Date 9/6/89

Time

Firm Name: Fi-Shock Corp.

Firm Address: Knoxville, Tn. 37914

Caller Name & Title: Dan McCarter, Chief Engineer

Telephone Number: 615-524-7380

Subject: RP 89 0087 / Model SS-250 Fence Controller

CACA Contact: Tim Jones

I explained to Mr. McCarter that CPSC had obtained the consumer unit involved and tested it, and determined that a defective triac had allowed a continual uninterrupted current at the output terminals. This, in conjunction with the fact that the consumer replaced the original rated fuses that repeatedly opened with fuses rated at four times the amperage led to the electrocution incident. (Mr. McCarter briefly discussed the UL requirement for grounding tests and abnormal tests.)

As a result of further questioning, Mr. McCarter

Copy to:

said that this was the only electrocution incident reported for any of the products' models, since the firm started in the late 1960's. He said that

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Pet-Shock Inc.

October 25, 1989

Mr. Tim Jones
Corrective Actions Division
U.S. Consumer Product Safety Commission
5401 Westbard Avenue Room 230
Washington DC 20207

Dear Mr. Jones:

Per the U.S. Consumer Product Safety Commission letter dated 9-14-89, this letter and the enclosures will provide our response to those specific items requested.

(Item 1.) A copy of the triac specification sheets is enclosed.

(Item 2.) Our records do not show the total number of triacs replaced, but the records do show the total number of control boards (PN 311-221) containing the triac that were replaced yearly. Please keep in mind that due to the purchased price of the control board versus the repair cost, we simply replace the control board instead of repairing it. Therefore, the following table is a yearly breakdown of the total number of controllers sold - versus total number of control boards replaced - versus number of fuses replaced.

Year	Total No. of Controllers Sold Containing Part Number 311-211 Control Board	Total No. of 311-221 Boards Replaced or Sold	Total Fuses Replaced
1985	488	0	0
1986	9,757	2	6
1987	11,182	23	53
1988	13,005	29	71
1989 (to date)	13,966	53	98

(Item 3.) See the table in Item Number 2.

(Item 4.) This particular item might best be answered by the two enclosed copies of "Fuseology". This is the criteria that we use in determining the correct fuse for use in any of our electric fence controllers.

(Item 5.) Quality Assurance Program for the SS-750 electric fence controller - Before I go into detail on this particular item, let me break down the manufacturing process into several categories so as to give you a better idea of the quality assurance program.

1.) Transformer - Completely manufactured (winding, testing and processing) at Fi-Shock, Inc. This process is as follows.

Transformer - First the transformer is fabricated and then tested (100%) for output voltage and amperage. Then the transformer is vacuum impregnated with a polyester varnish and then once again tested (100%) for output voltage and amperage.

2.) Control board PN 311-221 - completely manufactured out of house and is supplied to Fi-Shock as a finished product tested and ready to use. Therefore, all control boards that fail or become inoperative during the "bake in" test cycle are returned to the manufacturer for disposition.

3.) Plastic Enclosure - Completely manufactured (molded) at Fi-Shock, Inc.

4.) Power supply cordage, hardware, label, connectors, hook-up leads and etc. are purchased out of house. All of these items are purchased according to our and UL specifications. The transformer and enclosure go through in-house inspections, while all purchased components go through incoming inspections.

After the SS-750 has reached the final assembly stage, each unit is then subjected to the following tests. (100%)

1. Output.
2. Dielectric Breakdown.
3. "Bake in" Cycle. (16-24 hours at 132 VAC, 60 HZ)
4. Output after "Bake in" Cycle Test.

Finally, I hope you will find all of the above information to be a sufficient answer to your September 14, 1989 letter. Should you desire additional information on any of the above subject, please do not hesitate to contact me.

Sincerely,

Fi-Shock, Inc.

Danny McCarter

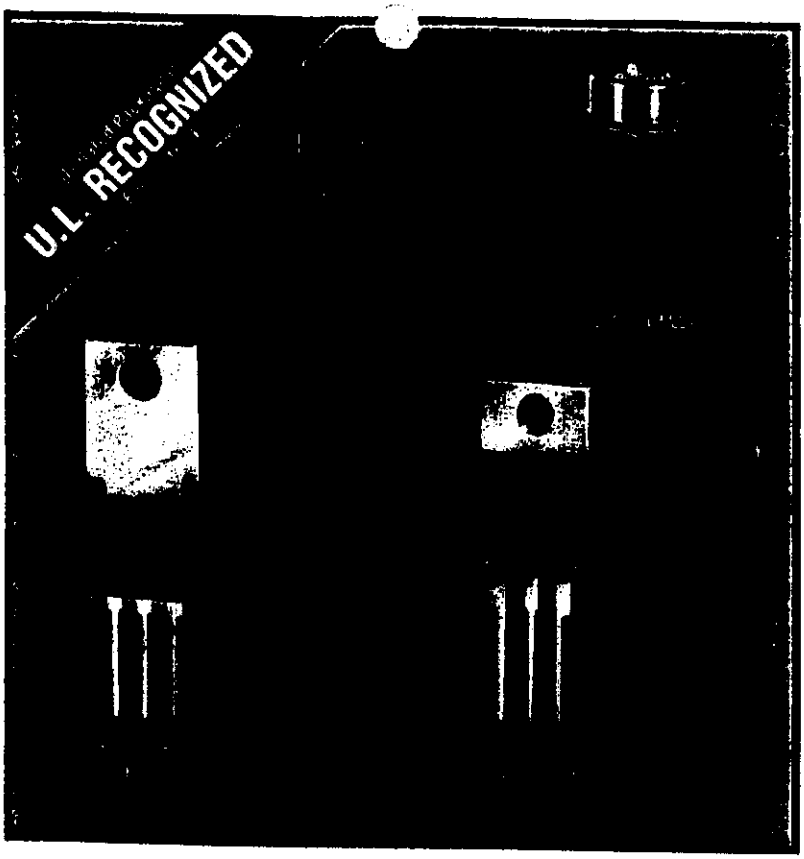
Danny McCarter
Chief Engineer

DM:plm

Enclosures

cc: CPSC Central Regional Center
230 South Dearborn Street Room 2944
Chicago, IL 60604

REFERENCE: ITEM # 1



TECCOR ELECTRONICS, INC.

P. O. BOX 61447
DALLAS, TEXAS 75261
PHONE 214/252-7651
TWX 910-860-5068
TELEX 79-1600

LOGIC TRIACS 1-8 AMPS

General Description

Teccor's line of logic triacs includes devices with current capacities through 8 Amperes. Voltage ranges available are from 200 to 400 Volts. This line features devices with guaranteed gate control in the second and fourth quadrant as well as control in the commonly used first and third quadrants. Four quadrant control devices form a group termed "logic triacs". They lend themselves to control by digital circuitry where positive pulses must control AC current in both directions through the device.

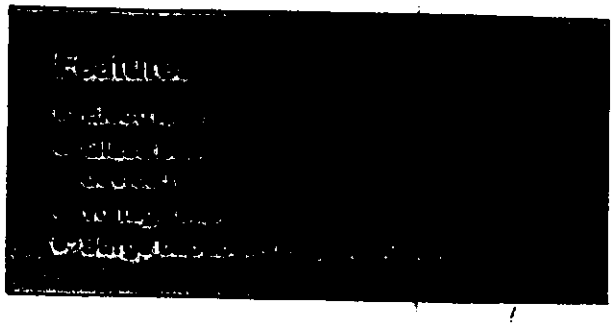
The logic triac is a bidirectional AC switch and is gate controlled for either polarity of main terminal voltage. Its primary purpose is for AC switching and phase control applications such as motor speed controls, temperature modulation controls, and lighting controls.

A wide range of package variations are available. The plastic TO-92 and THERMOTAB® configurations feature Teccor's electrically isolated construction where the case or tab is internally isolated. Tape and reel capability for the TO-92 is available.

A non-isolated metal can TO-5 package and plastic TO-202 also are available.

All Teccor triacs have glass passivated junctions. This glassing process prevents migration of contaminants and insures long device reliability with parameter stability.

Variations of devices covered in this data sheet are available for custom design applications. Please consult factory for further information.



LOGIC TRIACS 1-8 AMPS

Type	Part Number (Isolated)	Part Number (Non-Isolated)		Part Number (Isolated)	$I_{T(RMS)}$	V_{DRM}	I_{GT}				I_{DRM}	
					RMS On-State Current Conduction Angle of 360° (11)	Repetitive Peak Blocking Voltage (1)	DC Gate Trigger Current in Specific Operating Quadrants V_D = 12 VDC R_L = 60Ω (3) (6)				Peak Off-State Current (1) Gate Open V_{DRM} = Max Rated Value	
	PLASTIC TO-92	METAL CAN TO-5	TO-202AB TYPE 1	TO-220AB THERMOTAB®	Amps	Volts	mA				T_C = 25°C mA	T_C = 100°C mA
	For Dimensional Outline and Package Variations See Page 71				MAX	MIN	I MAX	II MAX	III MAX	IV MAX	MAX	MAX
1.0 Amp	L2010				1.0	200	3	3	3	3	.01	.1
	L2010				1.0	200	5	5	5	5	.01	.1
	L2010				1.0	200	10	10	10	10	.01	.1
	L2010				1.0	200	25	25	25	25	.01	.1
	L4010				1.0	400	3	3	3	3	.01	.1
	L4010				1.0	400	5	5	5	5	.01	.1
	L4010				1.0	400	10	10	10	10	.01	.1
	L4010				1.0	400	25	25	25	25	.01	.1
1.6 Amps				L2001L3	1.6	200	3	3	3	3	.02	.5
				L2001L5	1.6	200	5	5	5	5	.02	.5
				L2001L7	1.6	200	10	10	10	10	.02	.5
				L2001L9	1.6	200	25	25	25	25	.02	.5
				L4001L3	1.6	400	3	3	3	3	.02	.5
				L4001L5	1.6	400	5	5	5	5	.02	.5
				L4001L7	1.6	400	10	10	10	10	.02	.5
				L4001L9	1.6	400	25	25	25	25	.02	.5
3.0 Amps		L2003M3			3.0	200	3	3	3	3	.02	.5
		L2003M5			3.0	200	5	5	5	5	.02	.5
		L2003M7			3.0	200	10	10	10	10	.02	.5
		L2003M9			3.0	200	25	25	25	25	.02	.5
		L4003M3			3.0	400	3	3	3	3	.02	.5
		L4003M5			3.0	400	5	5	5	5	.02	.5
		L4003M7			3.0	400	10	10	10	10	.02	.5
		L4003M9			3.0	400	25	25	25	25	.02	.5
4.0 Amps			L2004F31	L2004L3	4	200	3	3	3	3	.02	.5
			L2004F51	L2004L5	4	200	5	5	5	5	.02	.5
			L2004F71	L2004L7	4	200	10	10	10	10	.02	.5
			L2004F91	L2004L9	4	200	25	25	25	25	.02	.5
			L4004F31	L4004L3	4	400	3	3	3	3	.02	.5
			L4004F51	L4004L5	4	400	5	5	5	5	.02	.5
			L4004F71	L4004L7	4	400	10	10	10	10	.02	.5
			L4004F91	L4004L9	4	400	25	25	25	25	.02	.5
6.0 Amps				L2006L6	6	200	5	5	5	25	.05	.5
				L2006L7	6	200	10	10	10	10	.05	.5
				L2006L9	6	200	25	25	25	25	.05	.5
				L4006L6	6	400	5	5	5	25	.05	.5
				L4006L7	6	400	10	10	10	10	.05	.5
				L4006L9	6	400	25	25	25	25	.05	.5
8.0 Amps				L2008L6	8	200	5	5	5	25	.05	.5
				L2008L7	8	200	10	10	10	10	.05	.5
				L2008L9	8	200	25	25	25	25	.05	.5
				L4008L6	8	400	5	5	5	25	.05	.5
				L4008L7	8	400	10	10	10	10	.05	.5
				L4008L9	8	400	25	25	25	25	.05	.5

For Part Number Definition See Page 4.

NOTES TO ELECTRICAL SPECIFICATIONS

(1) For either polarity of MT2 with reference to MT1 terminal.
(2) For either polarity of gate voltage (V_{GT}) with reference to MT1 terminal
(3) See Definition of Quadrants.
(4) See Figure 3 for I_T vs V_T.
(5) See Figure 5 for V_{GT} vs T_C
(6) See Figure 6 for I_{GT} vs T_C
(7) See Figure 4 for I_H vs T_C
(8) See Figure 8 for surge rating with specific durations.
(9) See Figure 7 for I_{gt} vs I_{GT}
(10) T_C=50°C for TO-92 devices; T_C=85°C for TO-202, type 1 and 3 devices; T_C=80°C for all other devices
(11) See Figure 1, 2A, & 2B.

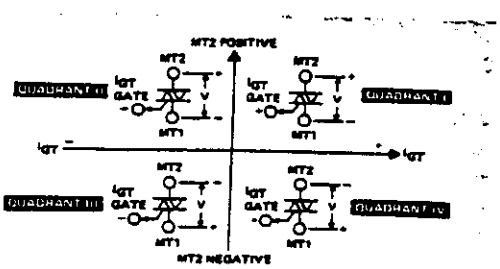
GENERAL NOTES

- All measurements are made at 60 Hz resistive load and at an ambient temperature of + 25 C unless otherwise specified
- Operating temperature range T_j is - 40°C to + 110 C TO-92 is - 65 C to + 110 C
- Storage temperature range is - 40°C to + 125 C TO-92 is - 65 C to + 150 C. TO-202 is - 40 C to + 150 C
- Lead solder temperature is maximum of + 230 C for 10 seconds maximum + 1/16" from case
- The case temperature (T_C) is measured as shown on dimensional outline drawings. See "Package Dimensions" section of this catalog

GATE CHARACTERISTICS

Teccor logic triacs may be gated with in-phase signals or unipolar pulses. If maximum surge capability is required, pulses should be one magnitude higher than minimum and with sharp rising waveform (1 µsec rise time)

DEFINITION OF QUADRANTS



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Electrical Specifications

V_{TM}	V_{GT}		I_H	I_{GTM}	P_{GM}	$P_{G(AV)}$	I_{TSM}		dv/dt	dv/dt	t_{gt}	I^2t
Peak On-State Voltage at Max. Rated RMS Current (1) (4) T_C = 25°C Volts	DC Gate-Trigger Voltage V_D = 12VDC R_L = 60Ω (2) (5) Volts T_C = 100°C	T_C = 25°C	Holding Current (1) (7) Gate Open Initial On-State Current = 200mA (DC) mA	Peak Gate-Trigger Current (3μs max) Amps	Peak Gate-Power Dissipation Pulse Width ≤3μs $I_{GT} \leq I_{GTM}$ Watts	Average Gate-Power Dissipation Watts	Peak One Cycle Surge (8) (10) Amps 60Hz	50Hz	Critical Rate of Rise of Commutation Voltage at Rated V_{DRM} & $I_{T(RMS)}$ Commutating di/dt = .54 Rated $I_{T(RMS)}$/msec. Gate Unenergized (1) (10) Volts/μs	Critical Rate of Rise of Off-State Voltage at Rated V_{DRM} Gate Open (1) T_C = 100°C Volts/μs	Gate Controlled Turn-On Time (9) I_{GT} = 200mA 0.1μs Rise Time μs	RMS Surge (Non-Repetitive) On-State Current For Period of 8.3 msec For Fusing Amp^2 sec
MAX	MIN	MAX	MAX						MIN	MIN	MAX	
1.6	0.2	2.0	5	1.0	10	0.2	20	16.7	1	10	3	1.6
1.6	0.2	2.0	10	1.0	10	0.2	20	16.7	1	10	3	1.6
1.6	0.2	2.0	15	1.0	10	0.2	20	16.7	1	20	3	1.6
1.6	0.2	2.0	25	1.0	10	0.2	20	16.7	1	25	3	1.6
1.6	0.2	2.0	5	1.0	10	0.2	20	16.7	1	10	3	1.6
1.6	0.2	2.0	10	1.0	10	0.2	20	16.7	1	10	3	1.6
1.6	0.2	2.0	15	1.0	10	0.2	20	16.7	1	20	3	1.6
1.6	0.2	2.0	25	1.0	10	0.2	20	16.7	1	25	3	1.6
1.6	0.2	2.0	5	1.2	15	0.3	40	33	1	10	3	6.6
1.6	0.2	2.0	10	1.2	15	0.3	40	33	1	10	3	6.6
1.6	0.2	2.0	15	1.2	15	0.3	40	33	1	20	3	6.6
1.6	0.2	2.0	25	1.2	15	0.3	40	33	1	25	3	6.6
1.6	0.2	2.0	5	1.2	15	0.3	40	33	1	10	3	6.6
1.6	0.2	2.0	10	1.2	15	0.3	40	33	1	10	3	6.6
1.6	0.2	2.0	15	1.2	15	0.3	40	33	1	20	3	6.6
1.6	0.2	2.0	25	1.2	15	0.3	40	33	1	25	3	6.6
1.6	0.2	2.0	15	1.6	18	0.4	80	65	2	30	3	26.0
1.6	0.2	2.0	15	1.6	18	0.4	80	65	2	30	3	26.0
1.6	0.2	2.0	30	1.6	18	0.4	80	65	2	40	3	26.0
1.6	0.2	2.0	15	1.6	18	0.4	80	65	2	25	3	26.0
1.6	0.2	2.0	15	1.6	18	0.4	80	65	2	25	3	26.0
1.6	0.2	2.0	30	1.6	18	0.4	80	65	2	30	3	26.0

THERMAL RESISTANCE (STEADY STATE) JUNCTION-TO-CASE & JUNCTION-TO-AMBIENT $R_{\theta JC}/R_{\theta JA}$ (TYP.) °C/W

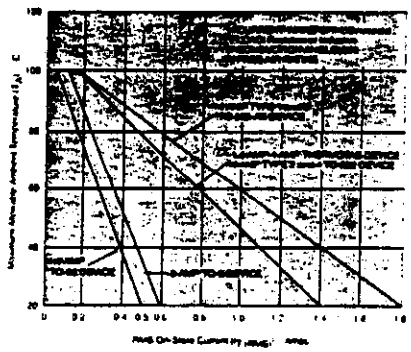
Type	PLASTIC TO-92	METAL CAN TO-5	TO-202AB TYPE 1	TO-220AB THERMOTAB®	TO-202AB TYPE 2
1.0 Amp	60/185				
1.6 Amp				5.2/65	
3.0 Amp		5.5/150			
4.0 Amp			4.8/45	4.2/60	5.0/60
6.0 Amp				3.5	
8.0 Amp				3.2	

ELECTRICAL ISOLATION FROM LEADS TO CASE (U.L. RECOGNIZED FILE #E71639)

VAC(RMS)	PLASTIC TO-92			TO-220AB THERMOTAB®	
1800	STANDARD			—	
2500	NO			STANDARD	
4000	NO			OPTIONAL*	

*For 4000V isolation use "V" Suffix

Figure 1—Maximum Allowable Ambient Temperature vs On-State Current



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LOGIC TRIACS 1-8 AMPS

Figure 2-A—Maximum Allowable Case Temperature vs On-State Current

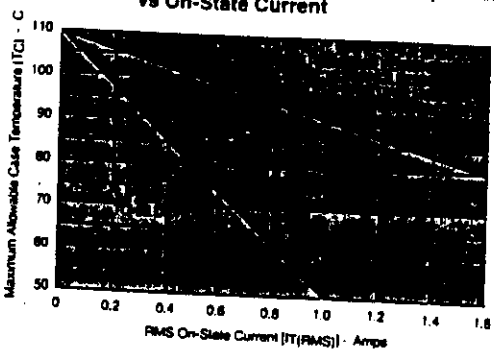


Figure 2-B—Maximum Allowable Case Temperature vs On-State Current

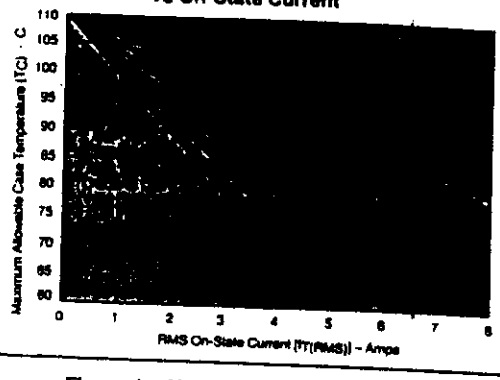


Figure 3—On-State Current vs On-State Voltage (Typical)

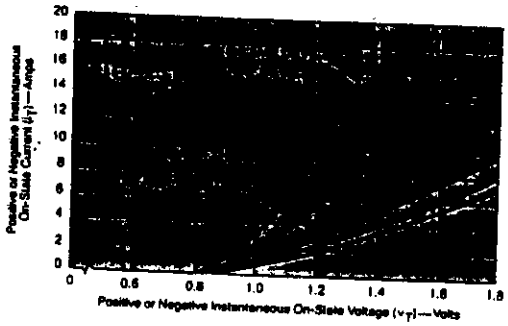


Figure 4—Normalized DC Holding Current vs Case Temperature

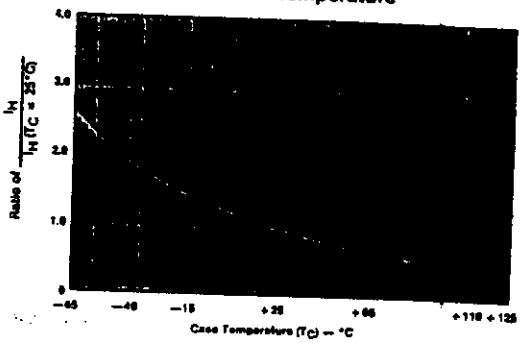


Figure 5—Normalized DC Gate Trigger Voltage for All Quadrants vs Case Temperature

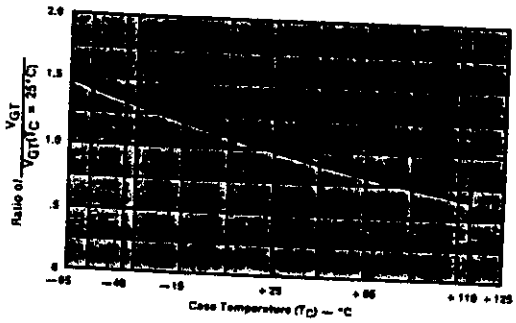


Figure 6—Normalized DC Gate Trigger Current for All Quadrants vs Case Temperature

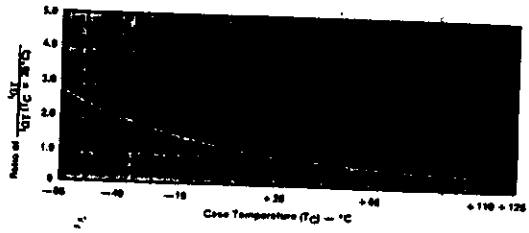


Figure 7—Typical Turn-On Time vs Gate Trigger Current

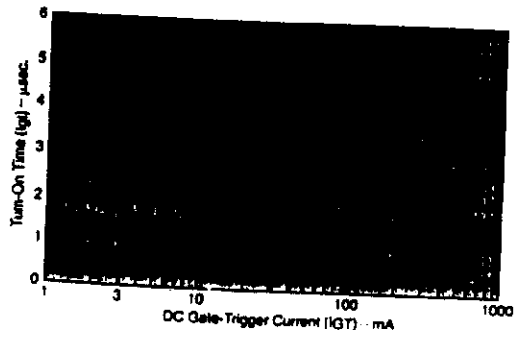
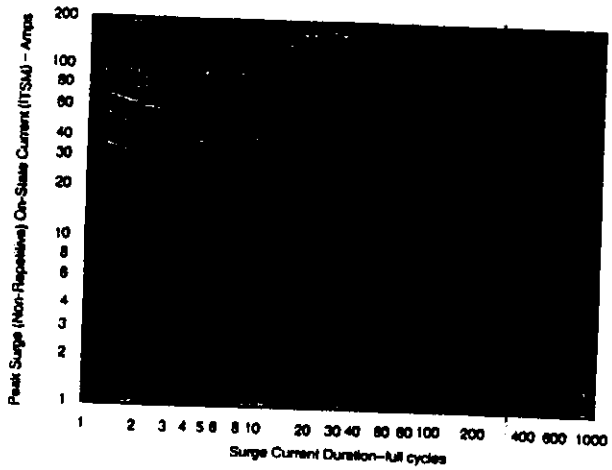


Figure 8—Peak Surge Current vs Surge Current Duration



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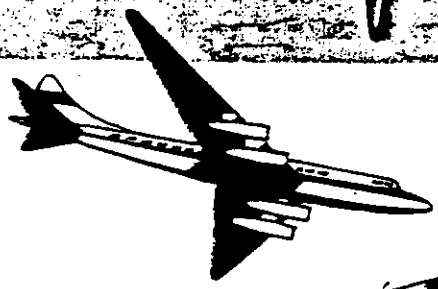
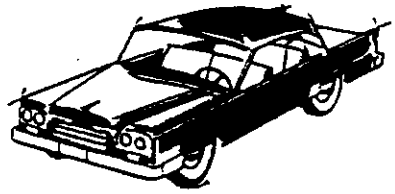
LITTELFUSE / TRACOR
(ES PLAINES, ILLINOIS

LITTELFUSE

FUSEOLOGY

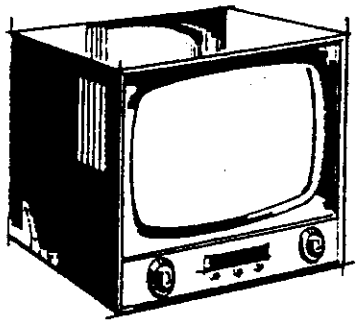
REFERENCE ITEM #





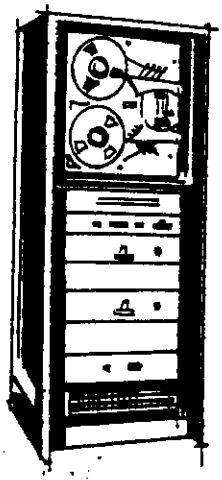
FUSE BACKGROUND

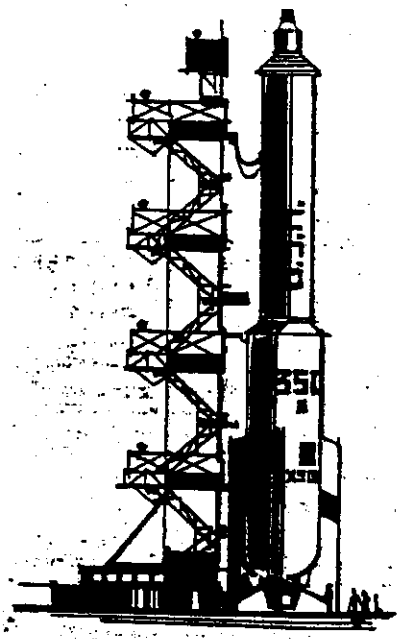
Fuses provide an intentionally weakened part of an electric circuit, and thereby act as a safety valve in the event of dangerous overloads. A super-condensation of this products' history begins with open-wire affairs, followed by Edison's enclosure of thin wire in a lamp base during the 1890's to make the first plug fuse. By 1904 the Underwriters' Laboratories had set up size and rating specifications to meet safety standards. The renewable fuses and automotive fuses came in 1914, and in 1927 Littelfuse started making very low amperage fuses for the budding electronics industry. Since then we have furnished fuses of many types, constantly improved in reliability and performance to meet expanding and developing markets.



Size	Diameter Inches	Length Inches
1AG	1/4	5/8
3AG	1/4	1-1/4
4AG	9/32	1-1/4
5AG	13/32	1-1/2
7AG	1/4	7/8
8AG	1/4	1
9AG	1/4	1-7/16

Table of Fuse Sizes





The fuse sizes in the above table began with the early "Automobile Glass" fuses, thus the term "AG". The numbers were applied chronologically as different manufacturers started making a new size, and "3AG" was the third size placed on the market. Other non-glass fuse sizes and constructions were determined by functional requirements, but they still retained the length or diameter dimensions of the glass fuses, and their designation was modified to AB in place of AG, e.g. 3AB indicating that the outer tube was constructed from Bakelite, fibre, ceramic or similar material other than glass. The largest size fuse in this group i.e., the 5AG is sometimes referred to as the "MIDGET", a name adopted from its use by the electrical industry and the National Electric Code range which normally recognizes fuses of 2" x 9/16" as the smallest standard fuse in use.

All fuses, regardless of size and type have a specified current rating, voltage rating, and fusing characteristic. The correct selection of fuses for safe, inexpensive and trouble-free circuit protection will only come when these three factors are thoroughly understood.

CURRENT RATING

This is a nominal value expressed in amperes or fractions of amperes, and one that is established by the manufacturer as a value of current which the fuse can be loaded to, based on a controlled set of test conditions. The test conditions referred

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being protected. Time-current characteristic charts (blow time vs. current) for Littelfuses, representing average total clearing times, are shown on pages 45 through 50.

b. Use a "Normal-Blo" fuse for resistive loads or other loads where no transients or surges are encountered. Where protection against short circuit hazard only is required, for maximum economy, a "Normal-Blo" fuse rather than a "Slo-Blo" fuse can be used. Select the highest amperage rating possible to prevent normal switching surges, transient spikes, etc., from causing premature fuse failure.

c. Use a "Slo-Blo" fuse where protection against a sustained overload current greater than 50% of normal load is required and high inrush or starting loads are present, as in capacitive or motor circuits.

d. Allow for environmental influence on the fuse. The higher the ambient temperature, the hotter the fuse will operate, and the shorter its life. Conversely, operating at low temperatures will prolong fuse life. Fuses with low melting temperature elements are more readily affected by changes in ambient temperature than fuses with high melting temperature elements. Figure 3 shows the ambient temperature influence on current carrying capacity. In general, curve A applies to "Slo-Blo" fuses and curve B is representative of "Normal-Blo" fuses.

e. For circuits involving vibration, high mechanical shock and acceleration, supported filament, light weight, non-tensioned constructions as found in the subminiature fuse designs and certain types of "Slo-Blo" fuses (consult factory) give the best performance.

GENERAL RECOMMENDATIONS

a. Insure that good contact is made by the fuseholder contacts, as this is vitally important when the normal operating current is greater than 5 amperes. High contact resistance can cause temperatures at the fuse contacts to exceed that of the fuse, with a consequent loss of control of burn-out point. The use of spring-temper beryllium copper silver plated fuse clips is recommended for all 4AG or smaller size fuses rated at 5 amperes or more to prevent excessive temperatures at the fuse contacts.

b. Specify sub-miniature sealed fuses e.g., high reliability Picofuses or Microfuses for applications involving extreme variations in climatic and environmental conditions.

SPECIFICATIONS

Underwriters' Laboratories, Inc. In this catalog reference to "Listed By Underwriters' Laboratories" signifies the fuses meet the requirements of Underwriters' Laboratories standard "Fuses" No. 198.6.

Reference to "Recognized under the component program of Underwriters' Laboratories" signifies the item is recognized under the component program of Underwriters' Laboratories, Inc. and application approval is required.

Military. A complete line of military fuses and holders (see page 60) are available in accordance with the following specifications:

MIL-F-15160	Fuses
MIL-F-23419	Fuses
MIL-F-19207	Fuseholders
MIL-F-21346	Clips and Blocks

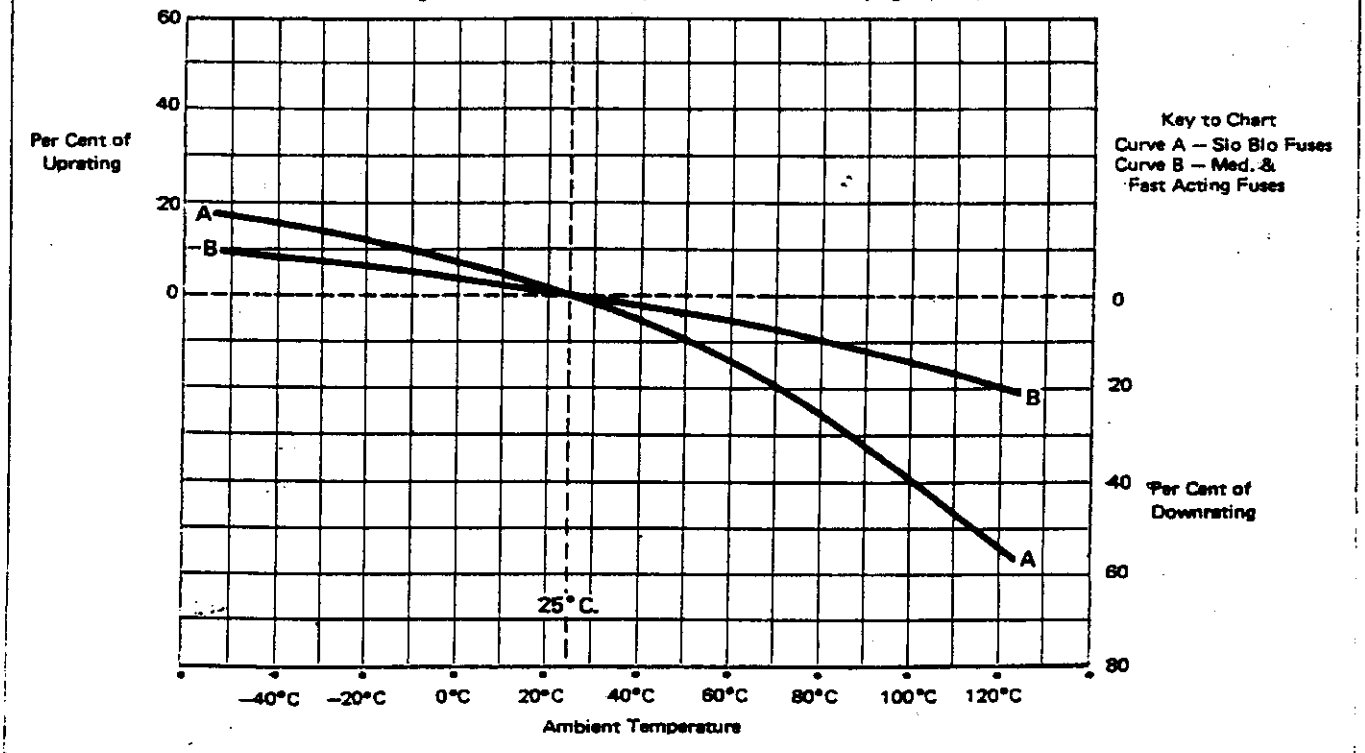
These specifications govern the construction and performance of fuses and fuse holders so that they are generally suitable for military applications.

SPECIAL COMPONENTS FOR CIRCUIT PROTECTION

We welcome your requests for quotes, or assistance in designing or selecting special types of circuit protection components for your particular application.

Our staff of engineers is at your service at all times to help solve your electrical protection problems, and you are invited to write or phone, giving details of your requirements.

Figure 3
Chart Showing Effect of Ambient Temperature on Current-Carrying Capacity



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BUSSMANN MFG.
ST. LOUIS, MISSOURI

FUSEOLOGY

REFERENCE : ITEM #4

Introduction

A fuse is an overcurrent protective device used to protect equipment. It derives its name from the verb "Fuse," meaning "to melt." A fuse is a current-responsive device, and it is placed in series with the electrical circuit it is intended to protect. When the current in the circuit exceeds its rated value, the current-carrying element in the fuse melts and opens the circuit. Although the function of the fuse is elementary, a thorough understanding of fuse characteristics and circuit overcurrent condition is necessary to specify the appropriate fuse.

Fuses have been in existence almost from the inception of electricity. Ever since their early existence, fuses have been found to be the most effective and reliable overcurrent protective device. Their simple operating principle and no need for maintenance means dependable protection. And as time progresses newer and better fuses continually evolve due to advances in technology.

Need for Overcurrent Protection

The opening of a fuse signifies that something is wrong with the circuit and should be corrected before the current is turned back on. The problem can be a defective or worn-out component, an accident, or a natural cause. When a problem exists and the fuse is called upon to open, the device should isolate only the faulty circuit from other unaffected circuits and it should respond in time to protect unaffected components in the faulty circuit. To properly protect a circuit, three considerations are necessary in the selection of a fuse:

1. During normal circuit operation, the fuse should not open unnecessarily.
2. The fuse must protect itself and the circuit components over the full range of overcurrent conditions—from overload to short-circuit; and
3. Only the nearest fuse on the line-side of the fault should open.

History of Fuses

The earliest fuse was no more than a bare wire stretched between two studs. The wire had a smaller cross-sectional area than the conductor it was protecting and hence, would melt out first. Some "open-link" types exist today, but are limited only to circuits with very low short-circuit energy release. After changing from copper to other lower temperature metals, tubes or enclosures were developed to contain the fusing metal. The enclosed fuse made possible the adding of a filler material to help quench the arc.

Many very low power applications, such as in automotive and electronic use, do not require the filler. The use of a glass enclosure gives the added advantage of seeing when a fuse is open. An early system of "AG" sizes, from "Automotive Glass" Fuses, was developed. Because this nomenclature persists today, a cross-reference is given in the **Fuse Index by Symbol** on page 3. The "5AG" size is sometimes referred to as "midget" fuses; this term is also cross-referenced for those familiar with it.

In addition to the many older designed fuses still available today, many new modern fuses are being developed to meet the new demands. The "small dimension" fuse is no longer only for electronic and automotive applications; many are now used in control circuits, branch circuits, supplementary protection and some applications for power and lighting.

Electrical Operation of a Fuse

There are two conditions to consider: normal circuit conditions and overcurrent circuit conditions. During normal circuit conditions, the fuse must carry the normal load current of the circuit; therefore, the current rating and the fusing characteristic in the momentary overload region must be considered to avoid unnecessary fuse opening. During overcurrent circuit conditions, the fuse must interrupt the overcurrent, limit the energy let-thru, and withstand the voltage across the fuse during arcing and after it opens. Therefore the voltage rating, interrupting rating, and the fusing characteristic over the full range must be considered for proper fuse selection and to protect the components in the faulty circuit.

Current Rating

The current rating of a fuse is a nominal value expressed in amperes and is established by the manufacturer as a value of current to which the fuse is rated based on a controlled set of test conditions set forth in Underwriters' Laboratories Standards or by other procedures. The current rating is always on the fuse.

Voltage Rating

The voltage rating is not a measure of its ability to withstand a specified voltage while carrying current. Rather, the voltage rating is the ability of the fuse to quickly extinguish the arc after the fuse element has melted and to prevent the system open-circuit voltage from restriking across the open fuse element. Because of the manner in which the voltage rating is applied, it is a maximum rms voltage value and expressed in **volts, or less.** For example, a 300 volt fuse will safely clear 300, 250, 125 or any value under 300 system volts across the open fuse element.

Overload Fusing Characteristics

The overload fusing characteristic is the relationship of the value of current through the fuse and the time required for the fuse to open or clear. The overload fusing characteristic can range widely in speed depending upon the fusible link material, construction of the fusible elements, and other design parameters.

For ease in selection, the fuses in this publication have been broadly classified into four major overload fusing characteristics.

1. **Time-delay fuse (slow blowing).** As used in this publication, means the fuse has a built-in delay in the overload region. Time delay slows down the opening time in the overload region. Time-delay fuses are widely used for general purpose circuits and especially suitable for loads with surge or starting currents.
2. **Dual-element, time-delay fuse (slow blowing).** These fuses have two separate fusible elements in series within the fuse case. This feature enables these types to have a very long time-delay in the overload region. Widely used for general purpose circuits and especially well suited for loads with starting inrush currents such as motors, solenoids, and transformers.
3. **Non-time-delay (or non delay).** These types have little intentional delay in the overload region. Typically used where fast speed of response is needed or where time-delay is unnecessary. Often sized for short-circuit protection only.
4. **Very fast-acting fuse.** These types of fuses have little or no intentional delay in the overload region, and are extremely current-limiting. Typically used for protection of semiconductor devices.
5. **Limiters.** There are two types of limiters presented in this publication. Limiters for short-circuit protection are distinguished from fuses by their intended purpose of providing only short-circuit protection for a component or circuit. Short-circuit limiters are not designed to provide overload protection. Heat limiters are for opening an electrical circuit when surrounding temperatures attain hazardous levels. Heat limiters are not intended for overcurrent protection.

For either time-delay fuses or dual-element, time-delay fuses, the amount of time-delay that can be achieved is determined by the mass of heat sink built-in which is increasingly restrictive as the fuse size diminishes.

Selecting a Fuse

1. **Current Rating.** The ampere rating of fuse selected is dependent upon:
   a. Degree of protection desired.
      1. Overload and short-circuit protection. Generally, select fuse ampere rating at 125% of the full load amperes.
      2. Short-circuit protection only. Select fuse ampere rating at 150% to 300% of equipment or circuit rating.
   b. Ambient temperature affects the current carrying capacity of fuses. Refer to page 53 for fuse ampere rerating for ambient temperature affects.
2. **Voltage Rating.** For general circuit protection, the voltage rating of the fuse should be equal to, or greater than the voltage of the circuit in which the fuse is applied.
3. **Time Current Characteristics.** The fuse time current characteristic should be compatible with the time-current characteristic of the load and the time current characteristic of the circuit components to be protected.
   a. Select a dual-element, time-delay or time-delay fuse where high inrush or starting loads are present as with motors, solenoids, or control transformers. (Usually sized at 125% of full load amperes.)
   b. Select non-time-delay fuses for resistive currents or other currents where no transients or surges are encountered. (Usually sized at 125% of full load amperes.)
   c. Select a limiter or non-time-delay fuse where short-circuit protection only is required. (Usually sized at 150% to 300% of circuit ampere rating.)
   d. Select very fast-acting fuses to protect very low energy withstand components, such as semiconductors.
   e. Test the selected fuse in the intended circuit under all normal circuit conditions that may include transient, inrush, or any other non-steady-state currents.

U.L. Test Requirements

Fuses marked as being "UL Listed" (Underwriters Laboratories Listed) in this bulletin are tested to the requirements of that organization. Tests consist of both ampere rating and short circuit tests.

The ampere rating tests are conducted at 110, 135 and 200% of rated current.

The fuse must carry 110% of its ampere rating until temperatures measured on its tube and terminals level off and do not continue to rise. This usually takes between 1½ and 4 hours. These temperatures are not allowed to exceed a 50°C rise. The tests are performed in a circuit specified in Underwriters Laboratories Standard UL 198.6.

In addition, the fuses must open at 135% of rated current within one hour, and open at 200% of rated current within 2 minutes. If the fuse is designated as "dual-element" or "time-delay," the fuse has an additional requirement to open in not less than 12 seconds at 200% of rated current.

The short circuit tests are performed at the rated voltage of a fuse which can be 125, 250, 300, 500 or 600 volts. The available short circuit current is 10,000 amperes AC, with the exception of some 250 volt fuses. 250 volt fuses can have short circuit ratings of 10,000 amperes or can adhere to the following schedule:

Ampere Rating of Fuse	Short Circuit Current
0 to 1	35
1.1 to 3.5	100
3.6 to 10	200
10.1 to 15	750
15.1 to 30	1500

Some fuses are shown as being "UL Recognized under the Components Program." This UL recognition is different from the above described listing in that the fuse has certain characteristics which are different from those described in UL 198.6. In this case, Underwriters Laboratories and the manufacturer agree on a test program designed to measure these characteristics and satisfy the requirements of the UL Safety Requirements. In some cases, the fuse may be designed to carry currents other than 110% of rated current or it may open at currents other than at 135% of rated current. Also, the short circuit rating might be different from those shown above.

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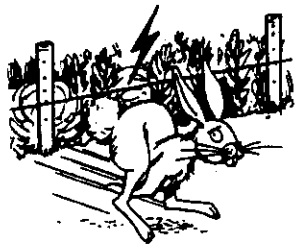
KEEPS PETS FROM DIGGING UNDER YOUR FENCE

Install Fido-Shock fence just inside your permanent fence and end runaway pet hassles.

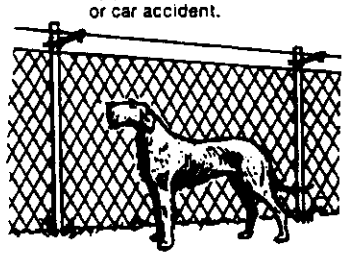
PROTECTS VEGETABLE GARDENS SMALL OR LARGE

Rabbits, squirrels and other varments will avoid your garden.



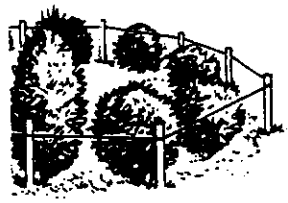
KEEPS PETS FROM JUMPING OVER FENCE

Wire kit posts to top of your permanent fence posts. Keeps runaway pet safe from theft or car accident.



PROTECTS FLOWERS, SHRUBS, AND SEED BEDS

Keep neighbors' dogs from digging up small plants and "drowning" shrubs.



MODELS SS-700, SS-750, AND SS-800
IMPORTANT INSTALLATION INSTRUCTIONS

NOTE: The instructions below are written for the SS-700-RP, SS-750-RP and SS-800-RP (battery operated) Fido-Shock Pet Deterrent Kits. However, if you have purchased a Model SS-700, SS-750 or SS-800 Fido-Shock controller only, the instructions will be helpful for constructing a fence with your own materials.

IMPORTANT: The SS-700 controller emits a continuous low-level current output, and the SS-750 and SS-800 controllers emit an intermittent current output—All three deliver a mild shock which is not pleasant, but is safe for humans and small animals and is usually well remembered. In fact, after several weeks or even several days use, you may elect to disconnect your fence as most pets will completely avoid it.

FENCING LAWS: Most states have laws defining what constitutes a legal partition fence or a fence along a highway or railway. Local ordinances usually specify acceptable fencing between adjacent home lots. In addition, local laws may prohibit the use of electric fence controllers. A permit may be required in some cases.

SAFETY TIPS: Use an electric fence sign to identify the charged fence. Inform family members and neighbors, especially small children, about the location and operation of your electric fence.

INSTALLATION: Install the controller (and battery for SS-800 Models) in a clean, dry area where moisture cannot drip or blow onto it. Do not mount the unit on the ground or on a shelf. Direct moisture on the battery can cause damage and shorten the discharge time. It is advisable to install the unit (and battery where applicable) inside a weatherproof box or close to a building with an overhang.

Drive fence posts 3 to 6 inches into the ground away from branches and stems of shrubs and plants. Drive the steel ground rod into the soil (preferably soil which stays moist) until only 2 inches remain above ground. Wrap and firmly secure a length of wire around the ground rod (a secure connection is essential for proper operation) and connect the other end of the wire to the ground terminal located on the left side of the fence controller. Wrap the wire once around the terminal between the two washers then securely tighten wing nut.

Connect another length of wire to the fence terminal on the right side of the unit and attach the wire to the fence posts with the enclosed cotter pins. Place a cotter pin through the hole in the fence post at the height you wish the fence wire to be, then bend the ends of the cotter pin back to keep the cotter pin securely fastened to the post. Thread the wire through the cotter pin as shown in diagrams. NOTE: THE COTTER PIN WILL BECOME "HOT" WHEN THE CONTROLLER IS ACTIVATED. You may also simply thread the wire through the holes in the posts without using cotter pins. Since the pole is plastic, the wire will not be grounded.

When you reach the end of the fence, wrap the wire securely around the cotter pin on the last post. For maximum efficiency,

Continued on back

Figure B

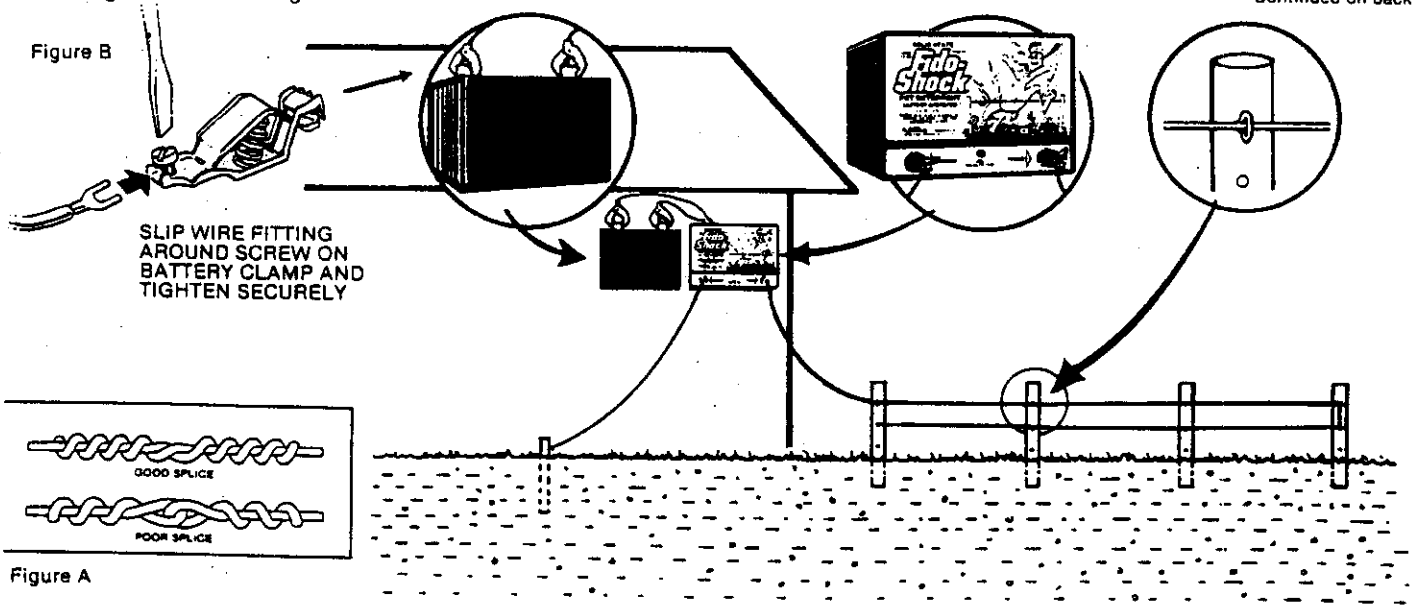


Figure A

DIAGRAM FOR MODEL SS-800

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Fi-Shock inc. 5360 NATIONAL DRIVE • KNOXVILLE, TENNESSEE 37914

CONSUMER PRODUCT SAFETY COMMISSION

ROUTE SLIP

TO Dave

- ☐ Take necessary action
- ☐ Approval or signature
- ☐ Comment
- ☐ Prepare reply
- ☐ Discuss with me
- ☐ For your information
- ☐ See remarks below

FROM H.V. DATE 6/5/89

REMARKS

I have discussed this with Tien Jones and Gene Raymon. Whether or not we open a Sears case may depend on determining why the victim's wife died. Do your best to get answers to Tien's questions. Call me so we can discuss it.

CPSC FORM 108 9/73

CONSUMER PRODUCT SAFETY COMMISSION

ROUTE SLIP

TO Eric Ault, FOCR

Re: RP 89-87 (Fi-Stock, Inc.)

Take necessary action	☑
Approval or signature	☐
Comment	☐
Prepare reply	☐
Discuss with me	☐
For your information	☐
See remarks below	☐

FROM Tim Jones, CACR DATE 5/11/89

REMARKS With ref. to 881115CCC2060 and our telcon, you agreed to have an investigation F/C to the ID to obtain or attempt to obtain:

1) Name, address, and phone # of attorney involved in the lawsuit.
2) The status of the lawsuit.
3) A failure analysis report of the unit involved in the electrocution incident, or possibly,
4) A sample of the consumer's unit.

CPSC FORM 108 9/73

6/5/89

Discussed what we need with B. Gentry and G. Guyman,

TJ

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CONSUMER PRODUCT SAFETY COMMISSION

ROUTE SLIP

TO ATL - SO

George Lester - Please have Dave G. attempt to get requested info. You or Dave can call Tim Jones if needed.

FROM [illegible]

DATE 5/2

- Take necessary action ☐
- Approval or signature ☐
- Comment ☐
- Prepare reply ☐
- Discuss with me ☐
- For your information ☐
- See remarks below ☐

REMARKS

CPSC FORM 108 9/73

CONSUMER PRODUCT SAFETY COMMISSION

ROUTE SLIP

TO GEORGE GARMAN

- [ ] Take necessary action
- [ ] Approval or signature
- [ ] Comment
- [ ] Prepare reply
- [ ] Discuss with me
- [ ] For your information
- [ ] See remarks below

FROM NSH DATE 5-24-85

REMARKS

Per our conversation of 5-23-85. I sent the entire package back so if you decide I need to do something on this - send it back.

P.S. - I don't know if this ever went to litigation or not.

Dave

CPSC FORM 108 9/73

Dan McCarter, Chief Engineer
Fi-Shock Inc.
5360 National Drive
Knoxville, TN 37914

RE: CPSC RP 89-87
Fido-Shock Pet Deterrent
Model No. SS-750

Dear Mr. McCarter:

This confirms our telephone conversation of December 13, 1989. During our discussion, I requested that you provide to this office all inventory of defective PN 311-221 control boards removed from Model No. SS-750 controllers returned to Fi-Shock, Inc. by consumers. I said that this request related to defective control boards now on hand at your company and, for an indefinite future period, to any defective control boards found in SS-750 controllers returned by consumers. You indicated that you would comply with the request.

Also, you stated that all defective control boards were returned to the manufacturer, and, at its option, were repaired or destroyed. Please confirm this in your response and identify the manufacturer (name and address) of the 311-221 control board.

If you have any questions, you may contact me at (301) 492-6608.

Sincerely,

Timothy D. Jones
Compliance Officer
Division of Corrective Actions
Directorate for Compliance and
Administrative Litigation

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Certified Mail

cc: Tom Boyd, President
Fi-Shock, Inc.
5360 National Drive
Knoxville, TN 37914

cc: CPSC Central Regional Center
230 South Dearborn Street, Room 2944
Chicago, Illinois 60604

~~RESTRICTED~~

SEP 14 1989

Dan McCarter, Chief Engineer
Fi-Shock Inc.
5360 National Drive
Knoxville, TN 37914

RE: CPSC RP 89-87
Fido-Shock
Pet Deterrent
Model No. SS-750

Dear Mr. McCarter:

To complete our investigation of the model SS-750 Fido-Shock Pet Deterrent (electric fence controller), the staff requests additional information from you. For the SS-750 controller or any other identically designed model constructed with the same components, our request is as follows:

1. With respect to the triac that your company purchased from Teccor Inc., Irving, Texas for the SS-750 controller, please provide the specifications for this component.

2. For any SS-750 controller returned for repair or otherwise, please review your service records and provide copies of all records which indicate replacement of the triac in question. If your service records do not show the replacement of defective triacs, estimate the total number of triacs replaced resulting from the return of consumer fence controllers.

3. From your service records and from consumer complaints, reports, etc., indicate the number of incidents involving blown fuses and nuisance fuse tripping.

4. Indicate the effectiveness of the fuses used with the SS-750 fence controller in preventing nuisance tripping.

5. Provide a detailed description or outline of the Fi-Shock Inc. quality assurance program for the SS-750 electric fence controller.

If you have any questions or comments, you may contact Tim Jones on (301) 492-6608. Please provide a written response within ten working days of receipt of this letter.

Sincerely,

Marc J. Schoem, Acting Director
Division of Corrective Actions
Directorate for Compliance and
Administrative Litigation

Certified Mail

cc: CPSC Central Regional Center
230 South Dearborn Street, Room 2944
Chicago, Illinois 60604

Tom Boyd, President
Fi-Shock, Inc.
5360 National Drive
Knoxville, TN 37914

Fi-Shock inc. 5360 NATIONAL DRIVE • KNOXVILLE, TENNESSEE 37914
615/524-7380

May 18, 1989

Mr. Tim Jones
Corrective Actions Division
U.S. Consumer Product Safety Commission
5401 Westbard Avenue, Room 230
Washington DC 20207

Subject: CPSC RP89-87 Fido-Shock Pet Deterrent Model SS-750

Dear Mr. Jones:

Per the U.S. Consumer Product Safety Commission letter dated May 4, 1989, this letter will provide our response to those specific items requested.

Item 1. A copy of the Underwriters Laboratories Inc. certification report for this product is enclosed.

Item 2. Copies of all engineering drawings and material specifications of the SS-750 controller are enclosed.

Item 3. To this date, no lawsuit involving any model SS-750 electric fence controller has been filed.

Item 4. A complete customer list for this product is enclosed.

Item 5. A sample of the SS-750 controller will be shipped to you by United Parcel Service (UPS).

16 C.F.R. 1115.13(d), Page 35001-02 "Full Report"

1. Danny McCarter, 5360 National Drive, Knoxville, TN 37914, Chief Engineer.

2. Fi-Shock, Inc.; 5360 National Drive, Knoxville, TN 37914. Manufacturing plant is the same.

3. Model SS-750 Fido-Shock Pet Deterrent Electric Fence Controller. The suggested retail price is $39.95 for the controller only and $49.95 for the RP Kit. Each individual unit has its own serial number imprinted into the label, and each unit is date coded as listed in our UL File 91879 (enclosed). A catalog advertisement sheet and the installation instructions are enclosed. Please note that each individual SS-750 controller is packaged with an installation instruction and warranty registration card.

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4. Not applicable at the present time.

5. Not applicable at the present time.

6. Our first report came with the CPSC Epidemiologic Investigation Report No. 881115CCC2060 dated April 4, 1989 and received on April 14, 1989.

7. One at the present time.

8. Fi-Shock, Inc. began manufacturing the Model SS-750 on July 19, 1985. The total number of SS-750 controllers manufactured since 7/19/85 is approximately 21,000.

9. The approximate numbers of SS-750 controllers in each of the following:

   Possession of manufacturer: 200
   Possession of private labelers: none
   Possession of distributors: 1,000
   Possession of retailers: unknown
   Possession of customers: 20,000

10. Not applicable at the present time.

11. Not applicable at the present time.

12. Not applicable at the present time.

13. The sale and distribution of the SS-750 unit and RP kit are created by inhouse sales people and through the use of manufacturer's representatives in some areas. Sales of the SS-750 are directed toward the mass merchandisers in home building centers, lumber yards, garden centers, farmers cooperatives and two-step distributors who in turn sell the product to retail outlets. The SS-750 controller is installed by the end user. Fi-Shock has no records other than the return of warranty cards to determine who the final end user is.

14. See enclosures.

15. See enclosures.

I hope you will find all of the above information plus the enlosures and the sample SS-750 controller to be sufficient in order for you to conduct your investigation. If you desire additional information concerning this particular subject, please do not hesitate to contact me.

Sincerely yours,

Danny McCarter

Dan McCarter
Chief Engineer

Enclosures

cc: CPSC Central Regional Center
230 South Dearborn Street, Room 2944
Chicago, IL 60604

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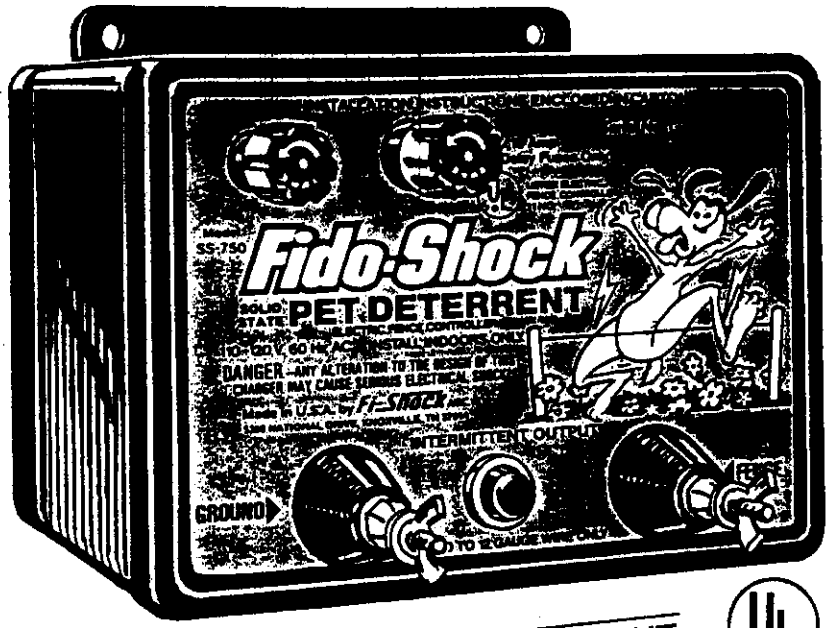
Fido-Shock®

COMPLETE LINE
OF ELECTRIC FENCE CONTROLLER
PET DETERRENTS



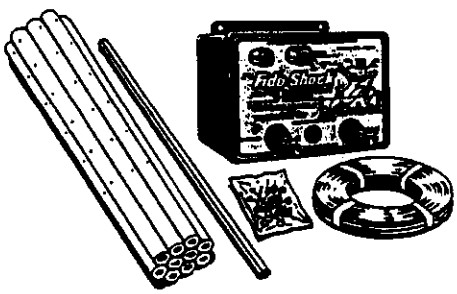
INTERMITTENT OUTPUT

NEW

Model SS-750
Fido-Shock Controller

Install Fido-Shock to deter pets and other small animals from performing damaging mischief. Every homeowner who has ever had to replace damaged flower beds or shrubs or clean up overturned garbage cans will appreciate Fido-Shock.

Model SS-750 is a low voltage fence controller which delivers intermittent one-second bursts of power. Small animals receive a mild but memorable shock and quickly learn to avoid protected areas. Excellent for protecting gardens and for keeping pets fenced in. Plugs into standard 110 volt outlet.



KIT INCLUDES:
- 1 Model SS-750 Fido-Shock controller
- 10 2-ft. plastic poles
- 100 ft. of fence wire
- 1 pkg. of cotter pins
- 1 2-ft. ground rod
- Complete installation instructions

Model SS-750-RP
Fido-Shock Kit

CONTAINS EVERYTHING NEEDED FOR INSTALLATION

The colorful self-seller carton is designed for self-serve customers. It clearly shows suggested applications and illustrates simple installation. The system can be quickly and easily installed. No special skill or know-how is required and only common household tools are needed.

Fi-Shock inc.
5360 NATIONAL DRIVE • KNOXVILLE, TENN. 37914